

WATER RESOURCES DEVELOPMENT

BY THE
U.S. ARMY CORPS OF ENGINEERS
IN

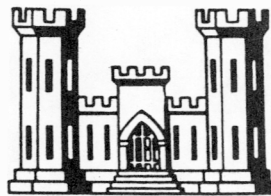


U.S. ARMY ENGINEER DIVISION
OHIO RIVER
CINCINNATI, OHIO
JANUARY, 1971

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RESOURCES
DEVELOPMENT**

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IN**

OHIO



1 January 1971

Inquiries concerning the projects, activities and areas described herein may be addressed as shown on the reverse side of this page.

Several Division and District Engineers are responsible for the projects, activities and areas described in this pamphlet, depending upon their locations. Division and District boundaries are indicated on the map appended to the pamphlet and the responsible Division or District office is noted after each project or activity title. Further information on particular projects, activities and areas may be obtained by addressing the appropriate Division or District Engineer as follows:

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INTRODUCTION

Water is one of our most important natural resources and its control, use and conservation are matters of national concern. This pamphlet provides current information on the scope and progress of the Corps of Engineers program for water resources development in Ohio.

The Corps of Engineers functions as an engineer consultant to Congress and most of the Corps water resources projects are developed by specific Congressional authorization. When local interests feel that a need exists for construction or improvement of a water resources project, they petition their representative in Congress. The Senator or Representative then requests the appropriate Congressional committee to direct the Corps of Engineers to make a survey and furnish a recommendation. Authority for a study is either a resolution adopted by appropriate Senate or House Committee or a Congressional Act.

A study assembles all data that would have a bearing on economic and engineering solutions of the problem. During the preparation of the study, public hearings are held to determine the wishes of local interests; the desires of local interests are fundamental not only because of the effects of construction on the local area, but also because under specific conditions the law requires them to participate in certain features of the project. During the preparation of the study, other Federal and non-Federal agencies concerned with any phase of resources planning or development are contacted to avoid conflict with their program or to incorporate features of their program into Corps projects. When all the data are analyzed and a determination made of the fullest possible use of the natural resources, the study with its recommendation is submitted to Congress and if approved, the recommended projects become authorized by an Act of Congress. After authorization, the projects still require Congressional appropriations before construction can begin.

Some studies may be confined to a small area and have a comparatively simple solution. Other studies may cover an entire river basin and require consideration of navigation, flood control, erosion control, hurricane protection, water supply, water quality control, hydroelectric power, major drainage, irrigation, recreation or other purposes that may be deemed necessary to promote the national welfare.

When Congress makes funds available for construction the Corps of Engineers prepares plans and specifications, awards contracts and supervises construction. The completed projects may be operated and maintained by the Corps or they may be transferred to another agency or to local interests to operate and maintain.

Congress has provided general authority in several laws that permits the Secretary of the Army and the Chief of Engineers to authorize projects of limited scope within fiscal year appropriations specified in the laws. These general authorities are described briefly below.

Small Flood Control Projects (Section 205, Flood Control Act of 1948 as amended). This legislation provides for construction of small flood control projects not specifically authorized by Congress when, in the opinion of the Chief of Engineers, such work is advisable. The Federal share in such projects may not exceed \$1,000,000 and must constitute a complete solution to the flood problem involved so as not to commit the United States to additional improvements to insure effective operation. Such projects are subject to the same requirements of feasibility and economic justification as the larger projects which require specific authorization by Congress.

Small Navigation Projects (Section 107, River and Harbor Act of 1960 as amended). This legislation authorizes the Corps of Engineers to construct small river and harbor improvement projects not specifically authorized by Congress when they will result in substantial benefits to navigation. The Federal share in such projects may not exceed \$500,000 and the projects must be complete in themselves and not commit the United States to any additional improvement to insure successful operation. Such projects are also subject to the same requirements of feasibility and economic justification as the larger projects which require specific authorization by Congress.

Small Beach Erosion Control Projects (Section 103, River and Harbor Act of 1962 as amended). This legislation provides for construction of small shore and beach restoration and protection projects not specifically authorized by Congress, when, in the opinion of the Chief of Engineers, such works are advisable. The Federal share in such projects may not exceed \$500,000. The projects must be

complete in themselves and not commit the United States to any additional improvement to insure successful operation. Such projects are subject to similar requirements of feasibility, economic justification, and cost sharing as the larger beach erosion control projects which require specific authorization by Congress.

Emergency Bank Protection (Section 14, Flood Control Act of 1946). Under this authority, the Corps of Engineers may spend up to \$50,000 in one locality during any one fiscal year for the construction of emergency bank protection works to prevent flood damage to highways, bridge approaches, and other public works endangered by bank erosion.

Snagging and Clearing (Section 3, River and Harbor Act of 1945). This act authorized the Corps of Engineers to undertake emergency work to clear or remove unreasonable obstructions from rivers, harbors, and other waterways in the interest of navigation.

Snagging and Clearing (Section 208, Flood Control Act of 1954). The Corps of Engineers is authorized, under this act, to spend up to \$100,000 on any single tributary during any one fiscal year for removal of accumulated snags and other debris, and for the clearing and straightening of stream channels when, in the opinion of the Chief of Engineers, such work is definitely in the interest of flood control.

Flood Fighting, Repair, and Rescue Work

(Public Law 99, 84th Congress). This law requires the Corps of Engineers to engage in flood fighting and rescue operations, and to repair or restore any flood control work threatened or destroyed by flood. In addition (Section 206, Flood Control Act of 1962), the Corps of Engineers may provide emergency protection for Federally authorized hurricane and shore protection projects when threatened, and repair and restore such works when damaged or destroyed by wind, wave, or water action of other than ordinary nature.

Removal of Wrecks and Obstructions (Public Law 189, 55th Congress). Under this law the Corps of Engineers is authorized to investigate wrecked vessels and other obstructions to navigation, and to insure removal at the expense of the owner or, under certain specific conditions, at the expense of the Federal Government.

Flood Plain Information Studies (Section 206, Flood Control Act of 1960 as amended). This legislation provides authority to compile and disseminate information to states and local communities, upon their request, to aid them in providing for use and regulation of flood plain areas. The work to be done by the Corps under this authority involves surveying and mapping of flood plain areas, together with hydrology and frequency studies necessary to establish the flood damage potential, flood heights, and the extent of inundation of the areas involved. Such information is provided to aid local interests in establishing right-of-way lines, stream clearance lines, and land use regulations.

TO OUR READERS:

Many responsible citizens are concerned today about the conservation and enhancement of our environment. We in the Army Corps of Engineers are concerned also. For almost two centuries the Corps, as the principal planner and developer of America's water resources, has responded to the changing needs of the Nation for the various benefits of water resources development. In this tradition, we are determined to remain sensitive to the American people's growing awareness of the importance of environmental quality. We are scrutinizing and revising our planning techniques to insure that they accurately reflect our concern for environmental values. The problems, while complex, are not insurmountable.

The Corps will continue to seek balance in meeting the environmental and developmental needs of our Nation. Merely determining whether or not a specific engineering solution is economically justified is not enough. We shall encourage and support efforts to bring the best existing ecological knowledge and insights to bear on planning, developing, and managing the Nation's water and related land resources. Environmental values will receive full consideration along with economic, social, and technical factors.

To realize the goals of environmental conservation, we must have active public participation in the planning process. We shall provide governmental and nongovernmental agencies and the public with timely information opportunities, consequences, benefits and costs — financial and environmental. Before making recommendations, we shall actively solicit the views of those affected by our proposals.

As a citizen interested in the future of this State's water resources, you have opinions that are of value to the Corps of Engineers. Any steps we take must be taken together.



F. J. CLARKE
Lieutenant General, USA
Chief of Engineers



A MODERN OHIO RIVER TOW
APPROACHING CAPTAIN ANTHONY MELDAHL LOCKS AND DAM

NAVIGATION PROJECTS COMPLETED

Navigation projects completed in Ohio by the Corps of Engineers include harbor facilities at Lake Erie ports, ranging in size from shipping ports to facilities which serve primarily as refuge harbors and ports-of-call for small craft. Some harbors listed as completed projects in earlier editions of this pamphlet are currently undergoing further improvement and are now included in the section headed "Navigation Projects Under Way." In addition to the harbors in northern Ohio, the Ohio River, which lies along the southern boundary of the state, has been canalized throughout its entire length and is a very important element of the inland waterway system. Substantial savings in transportation costs have been made possible as a result of these improvements, and they also have contributed to the recreational use of Ohio's waters.

Description of the completed navigation projects in Ohio follow.

ASHTABULA HARBOR **Buffalo District**

Ashtabula Harbor is located in Ashtabula County on the south shore of Lake Erie at the mouth of Ashtabula River, 59 miles easterly from Cleveland. Improvements by the United States have provided an outer harbor 500 acres in area, protected by a breakwater system about 12,200 feet in aggregate length; an entrance 29 feet deep between breakwaters; a channel ranging in depth from 28 to 16 feet, extending from the harbor entrance into Ashtabula River to a point two miles above its mouth; an access channel and turning basin, 28 feet deep, in the east outer harbor; and a 22-foot deep anchorage basin between the entrance channel and the east outer harbor basin. These features of the project were completed in 1968. In total, Federal costs for construction of improvements to the harbor were \$11,100,000. Additional improvements at this harbor are authorized (see "Authorized Navigation Projects") but they are not currently being programmed.

The harbor contains rail-connected iron ore and coal terminals, general cargo, stone, sand and gravel docks. Average annual traffic for the five-year period 1965 through 1969 amounted to 9,321,000 net tons. The 1969 traffic was 10,820,000 tons. The principal receipt and major item of traffic is iron ore.

CONNEAUT HARBOR **Buffalo District**

Conneaut Harbor is situated on the south shore of Lake Erie at the mouth of Conneaut River, in Ashtabula County, 73 miles easterly from Cleveland. Improvements by the United States have provided an outer harbor, the deepened portion of which is about 142 acres in extent, protected by a breakwater system about 10,800 feet in aggregate lengths. The main portion of the outer harbor has been deepened to 28 feet, with an adjacent 22-foot deep maneuvering and anchorage area. The lower one-half mile of Conneaut River has been deepened to 27 feet. An 8-foot deep approach channel for small boats from the deepened portion of the outer harbor into the public dock operated by the Conneaut Port Authority has been provided. These features of the project were completed in 1967. In total, Federal costs for construction of these improvements to the harbor were \$7,540,000.

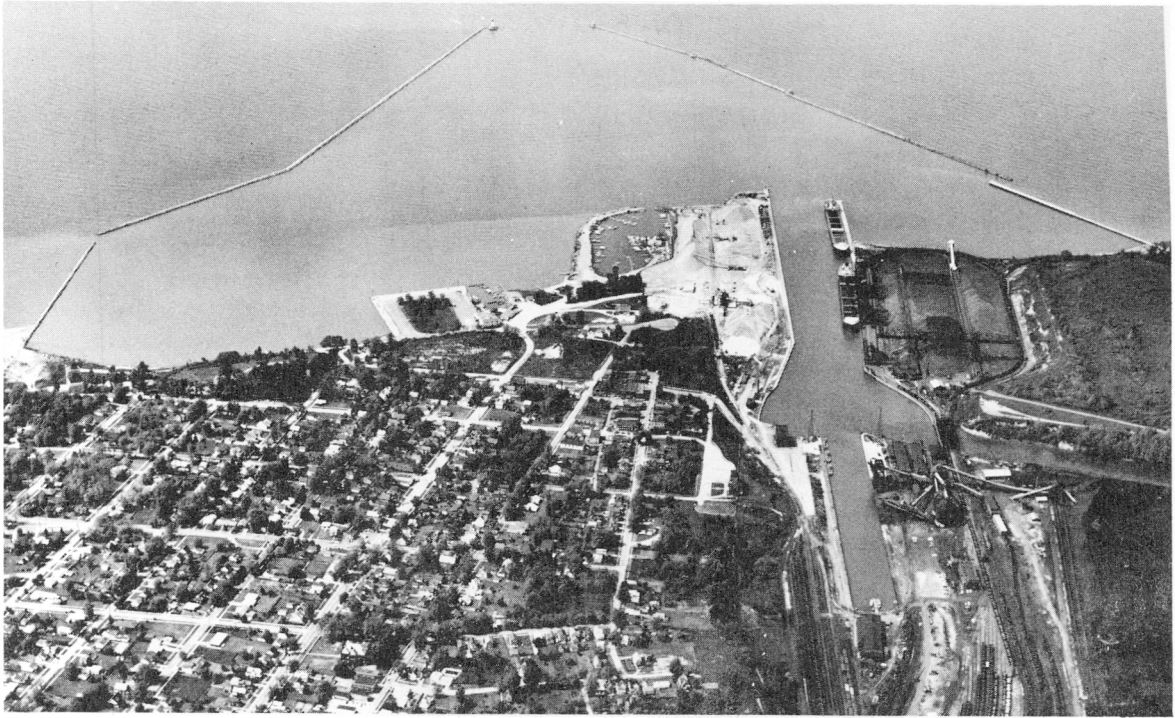
Additional improvements at this harbor are authorized (see "Authorized Navigation Projects") but they have not yet been started.

In addition to the public dock, the Conneaut Port Authority also operates an artificial lagoon off the outer harbor which serves as a protected mooring area for small recreation craft and commercial fishing vessels. There are industrial terminals along the Conneaut River channel. Iron ore is the principal receipt and the major item of traffic. Average annual traffic for the five-year period 1965 through 1969 amounted to 12,780,000 tons. Traffic in 1969 totaled 13,920,000 tons.

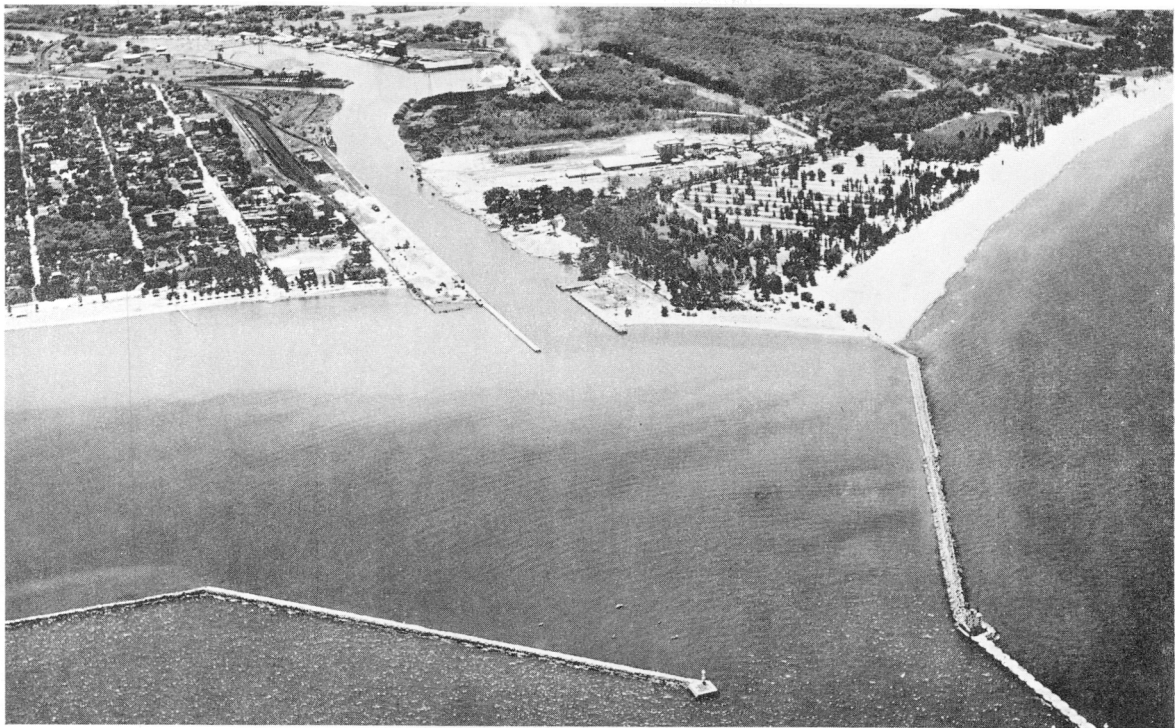
FAIRPORT HARBOR **Buffalo District**

Fairport Harbor is located in Lake County on the south shore of Lake Erie at the mouth of Grand River. A breakwater-protected outer harbor 25 feet deep and some 360 acres in area, an inner harbor 24 to 21 feet deep consisting of the lower 1.5 miles of Grand River, a turning basin 18 feet deep, and a secondary channel 8 feet deep have been provided. These, the active features of the project, were completed in 1956 at a cost of \$2,590,000.

Additional improvements at this harbor are authorized (see "Authorized Navigation Projects")



CONNEAUT HARBOR
THE BREAKWATER SHORE ARM AT THE RIGHT IS A RECENT PROJECT IMPROVEMENT



FAIRPORT HARBOR
SHOWING NUMEROUS STOCKPILES OF STONE, SAND AND GRAVEL RECEIVED AT
THE PORT, AND SALT MINE AND SHIPPING FACILITIES NEAR RIGHT CENTER

but they are not currently being programmed.

All terminal facilities at Fairport Harbor are privately owned. They include limestone, coal, sand and gravel, salt and fish docks. Average annual traffic in the harbor for the five-year period 1965 through 1969 amounted to 2,116,000 tons. Commerce in 1969 was 2,612,000 tons.

HURON HARBOR Buffalo District

Huron Harbor is situated on the south shore of Lake Erie, in Erie County, at the mouth of Huron River, 47 miles westerly from Cleveland. Improvements completed by the United States have provided an entrance channel from Lake Erie to the mouth of the Huron River, protected by an east breakwater and west pier aggregating 4,973 feet in length. The channel width varies from 400 feet in the lake to 250 feet at the inner end. Depth is 25 feet in soft material and 26 feet in hard material. Within the river, an enlarged turning basin has been provided. In total, Federal costs for construction of these improvements to the harbor, completed in 1940, were \$1,030,000.

Additional improvements at this harbor are authorized (see "Authorized Navigation Projects") but they have not yet been started.

The channel of Huron River has been deepened, widened, and maintained for a distance of over one mile above the limits of Federal improvement by owners of private terminal facilities. They have also maintained the Federally enlarged turning basin.

In addition to the many private terminals at the harbor, one dock owned by the city of Huron is open to the public. Average annual traffic for the five-year period 1965 through 1969 amounted to 2,010,000 net tons, principally iron ore receipts. Commerce in 1969 amounted to 3,315,000 net tons.

MAUMEE RIVER Detroit District

This river rises near Fort Wayne, Indiana, and flows northeasterly into Lake Erie at Toledo. The project is upstream from the improvement to Toledo Harbor, Ohio. Improvement by the United States provided for a channel 60 feet in width and 8 feet in depth between the cities of Maumee and Perrysburg, Ohio, and in deepening the channel across the Delaware Flats. Operations were commenced in 1872 and continued in 1873, but not completed. No work has been done since 1873. In total, Federal costs for construction of improvements to the river were \$7,000.



**HURON HARBOR
SHOWING BULK CARGO TERMINALS, AND EXPANDING SMALL BOAT DEVELOPMENTS
UPSTREAM OF THE FEDERAL PROJECT IMPROVEMENTS**

The traffic is composed entirely of small recreational craft. Controlling depths are 6 feet from the upstream limit of the Toledo Harbor improvements to the Ohio Turnpike Bridge and then about 2 feet to the upstream limit of the project.

OHIO RIVER

Ohio River Division

The Ohio River flows 981 miles from the junction of the Allegheny and Monongahela Rivers at Pittsburgh, Pennsylvania to the Mississippi River near Cairo, Illinois. The entire river has been improved by construction of locks and dams to provide a 9-foot channel and by open channel work to remove obstructions and assure adequate channel widths.

The Ohio River navigation project began in 1825 with channel improvements, followed in 1830 by a canal with a set of three locks to pass the "Falls of the Ohio" at Louisville, Kentucky. Until 1885, when a dam with a lock was built near Pittsburgh, river improvement consisted of clearing wrecks and snags, channel dredging and building training dikes and jetties.

Because the Ohio was too shallow almost every summer and fall for navigation, Congress authorized construction of a series of locks and dams. Twelve were built before 1910 and canalization of the river was completed in 1929. By then, 50 lock and dam structures had been built to assure year-round depths of 9 feet from the Mississippi River to Pittsburgh. The dams were made with wooden wickets that were raised to hold back water during periods of low flow and dropped to the river bottom during high water, permitting open river navigation without need of locking. By 1937, Montgomery and Gallipolis units were in operation and they reduced the system to 46 locks and dams that were used for many years. With a few exceptions, the dams were of the movable type, with a navigable pass varying from 600 to 1,248 feet and one or more regulating weirs. At each dam a lock with usable dimensions of 110 feet by 600 feet was provided.

The open channel work originally provided channels for steamboats 400 to 600 feet wide at shallow points and crossing bars, with ice piers for shelter from ice flows. A 300 foot minimum width channel is now maintained for the more powerful modern tow boats.

Over 450 miles of the improvement are contiguous to the southern boundary of Ohio and afford direct access for shipment and receipt of commodities over the far-flung inland navigation system, as well as connection with the Great Lakes system and the Gulf Intracoastal Waterway. In conjunction with tributaries improved for navigation, the Ohio River is an important part of the Mississippi River navigation system.

Two-thirds of the freight traffic are bulk forms of energy; coal, crude oil and petroleum products. Other major commodities transported are sand and gravel, iron and steel, chemicals and grain. Average annual traffic on the Ohio River for the five year period ending in 1969 (the latest available) was 115 million tons. The 1969 reported movement was 126 million tons.

The Ohio River is also a 981 mile long recreational lake. The stable summer pools above the dams have had substantial private shorefront recreational development, and over 300 small boat facilities were in use in 1970. Federally developed water access points had 1,610,000 recreational visitors in 1969.

To date, two dam structures have been modified to accommodate possible future highway bridges. Development of hydroelectric power under Federal Power Commission license has been investigated at several locations and power is now being produced at two locations.

The Ohio River carries an increasing amount of freight. Waterborne traffic of 22 million tons a year in 1929 grew to 126 million tons in 1969. The annual ton-mile figure increased 18 times over 40 years to the 27.3 billion recorded for 1969. There has also been a rapid development in towing equipment so tows and barges are larger and longer. To gain efficiency, meet new needs, and permit additional growth a replacement and modernization program was started in the early 1950's. As now planned, the Ohio River will have 19 non-navigable gated dams, each with dual lock chambers and at least one 1,200 foot long and 110 foot wide lock. The dams are higher so two or three of the older structures can be eliminated and tows will have longer distances between lockages. Since the modernization program began in 1955 the number of dams in operation has been reduced from 46 to 29.

The total cost for the Ohio River navigation development to 30 June 1970, is \$750 million for new construction work, excluding \$51 million for

old structures which have been replaced, and \$295 million for operation, maintenance and rehabilitation.

The locks and dams under construction are described in the section "Navigation Projects Underway." Completed Ohio River locks and dams that have a direct effect on Ohio are described below.

BELLEVILLE LOCKS AND DAM

**Ohio and West Virginia
Huntington District**

The Belleville Locks and Dam project is located on the Ohio River between Belleville, West Virginia, and Reedsville, Ohio. The project replaced three obsolete locks and dams on the Ohio River and one on the Muskingum River. The dam provides a pool with a minimum navigable depth of 9 feet extending 42 miles upstream to the Willow Island Locks and Dam now under construction. The two lock chambers are located side by side; the main lock has usable dimensions of 110 feet by 1,200 feet and the auxiliary lock is 110 feet by 600 feet. The dam is a non-navigable, gated structure with a lift of 22 feet between normal lower and upper pools. The estimated Federal cost is \$62,400,000. The dam was completed for operation in 1969.

CAPTAIN ANTHONY MELDAHL LOCKS AND DAM

**Kentucky and Ohio
Huntington District**

The Captain Anthony Meldahl Locks and Dam project is located on the Ohio River near Chilo, Ohio. The project replaced four obsolete locks and dams on the Ohio River and provides a pool with a minimum navigable depth of 9 feet, extending 95 miles upstream to Greenup Locks and Dam. The locks consist of two parallel chambers, side by side, each 110 feet wide. The main lock is 1,200 feet long, while the length of the auxiliary lock is but 600 feet. The dam is a non-navigable, gated structure with a lift of 30 feet between normal lower and upper pools. The present estimated Federal cost is \$74,000,000. The locks were placed in operation in November 1962. The dam was completed for operation late in 1964.

GALLIPOLIS LOCKS AND DAM

**Ohio and West Virginia
Huntington District**

Gallipolis Locks and Dam are located approximately 14 miles downstream from the mouth of the Kanawha River. These structures were completed in 1937 at a cost of \$9,700,000 and



BELLEVILLE LOCKS AND DAM



GREENUP LOCKS AND DAM

were the most modern of the lock and dam system prior to the modernization program now under way. They replaced three obsolete locks and dams on the Kanawha River and three obsolete projects on the Ohio River, and provide a pool that extends 42 miles upstream to the Racine Locks and Dam. A roller-gate type dam regulates the flow between the upper and lower pools. Two parallel locks, 110 feet by 600 feet and 110 feet by 360 feet, are provided for navigation between the two pools which have a 23-foot difference in elevation. These locks are only about one-half the length of the other locks in the modernized system currently being constructed on the Ohio River. Studies are under way to determine the advisability of modernizing the project to provide a uniform lockage system throughout the central reach of the Ohio River.

GREENUP LOCKS AND DAM **Kentucky, Ohio and West Virginia** **Huntington District**

The Greenup Locks and Dam, located on the Ohio River near Greenup, Kentucky, were placed in operation in the latter part of 1962 and completed in June 1964. The project replaced four obsolete locks and dams on the Ohio River and provides a pool with a minimum navigable depth of 9 feet extending 62 miles upstream to the existing

Gallipolis Locks and Dam. Thus, all of the important Huntington-Ashland-Ironton harbor area is located within one pool. The two locks are located side by side; the main lock is 110 feet by 1,200 feet in usable dimensions and the auxiliary lock is 110 feet by 600 feet. The dam is a non-navigable, gated structure with a lift of 30 feet between normal lower and upper pools. The total federal cost is about \$55,720,000. Non-Federal funds were contributed for modifications of the substructure so that a highway bridge could be supported at some future date.

LOCK AND DAM NO. 12 **Ohio and West Virginia** **Pittsburgh District**

This structure, constructed at a Federal cost of about \$1,200,000, is located at Warwood, West Virginia, and has been operated and maintained since 1916. The structure has a single lock 110 feet wide and 600 feet long with a dam 1,120 feet in length, of which 700 feet is a navigable pass. The lift is 8.4 feet and a navigation pool, reduced to a length of only 3.2 miles, extends upstream to the recently completed Pike Island Locks and Dam. The Hannibal Locks and Dam, currently under construction, will replace this structure.

LOCK AND DAM NO. 13
Ohio and West Virginia
Pittsburgh District

Lock and Dam 13, operated and maintained since 1911, is located near McMechen, West Virginia. The structure constructed at a Federal cost of \$1,200,000, has a single lock of 110 feet by 600 feet. The total length of dam is 996 feet and includes a 632-foot navigable pass section. The lift is 7.3 feet and a navigation pool extends upstream for 8.7 miles. The Hannibal Locks and Dam, currently under construction, will replace this structure.

LOCK AND DAM NO. 14
Ohio and West Virginia
Pittsburgh District

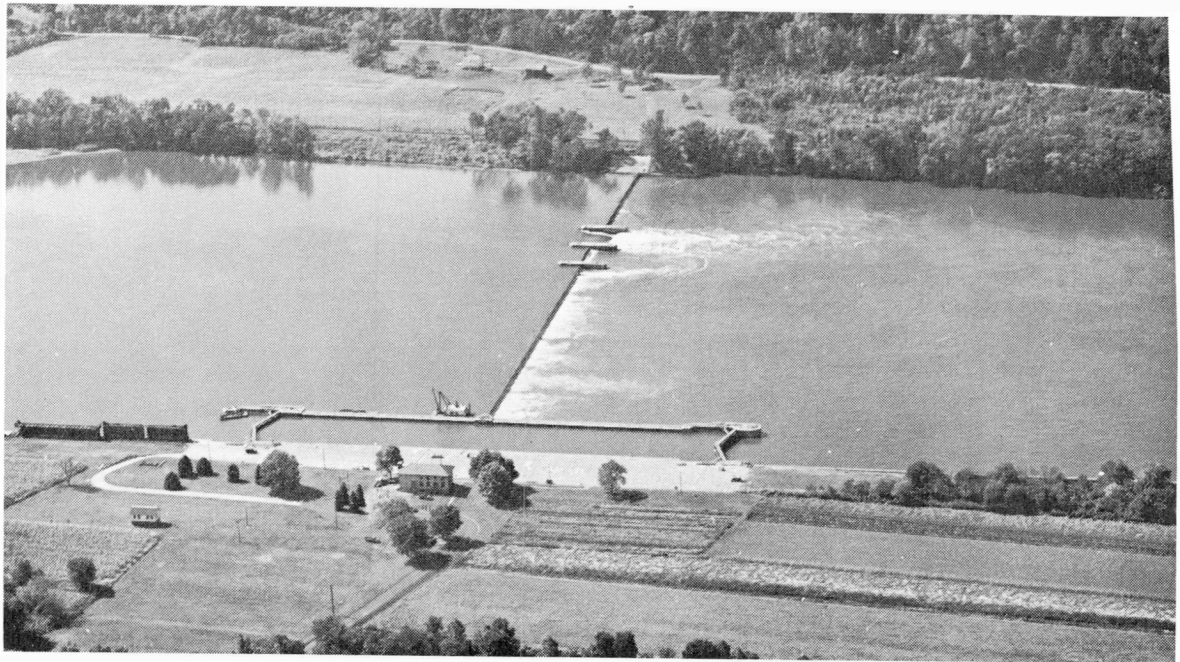
This structure, located upstream of Clarington, Ohio, was constructed at a Federal cost of \$1,100,000, and has been operated and maintained since 1917. The lock and dam consists of a single lock, 110 feet by 600 feet, and a 956-foot dam of which 600 feet is a navigable pass. The structure has a lift of 8.3 feet and extends the navigation pool upstream for 17.9 miles. The Hannibal Locks and Dam, currently under construction will replace this structure.

LOCK AND DAM NO. 15
Ohio and West Virginia
Huntington District

Lock and Dam No. 15 is located on the Ohio River downstream from New Martinsville, West Virginia. Placed in operation in 1916, the project was included in the original navigation system providing a 9-foot minimum channel depth on the Ohio River. A 7.8-foot lift is provided by the project which is comprised of a movable wicket dam with a single navigation lock measuring 110 feet by 600 feet. Construction of Willow Island Locks and Dam which is under way will replace Lock and Dam No. 15.

LOCK AND DAM NO. 16
Ohio and West Virginia
Huntington District

Lock and Dam No. 16 is located on the Ohio River upstream from St. Marys, West Virginia. Completed for operation in 1917, the project was included in the original navigation system providing a 9-foot minimum channel depth on the Ohio. A 7.8-foot lift is provided by the project which is comprised of a movable wicket dam with a single navigation lock measuring 110 feet by 600 feet. Construction of Willow Island Locks and Dam which is under way, will replace Lock and Dam No. 16.



LOCK & DAM NO. 17
PART OF ORIGINAL OHIO RIVER NAVIGATION SYSTEM

LOCK AND DAM NO. 17
Ohio and West Virginia
Huntington District

Lock and Dam No. 17 is located on the Ohio River upstream from Marietta, Ohio. The project was placed in operation in 1918 as part of the original system providing a minimum 9-foot navigable channel on the Ohio River. An 8.2-foot lift is provided by the project which is comprised of a movable wicket dam with a single navigation lock measuring 110 feet by 600 feet. Construction of Willow Island Locks and Dam which is under way, will replace Lock and Dam No. 17.

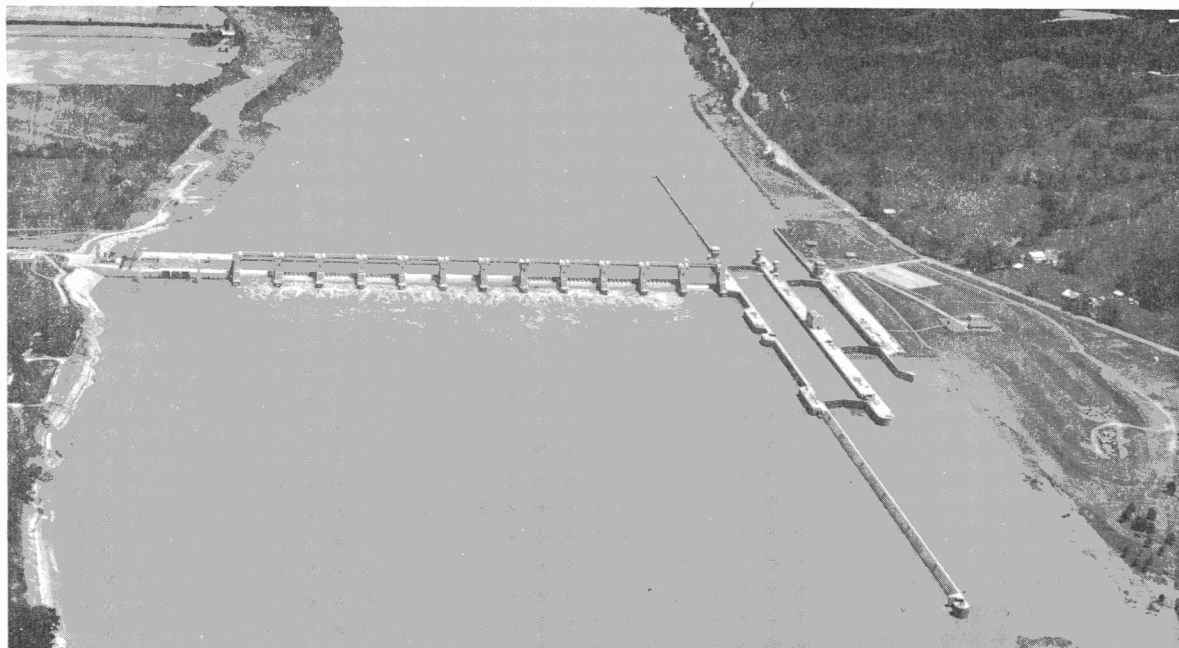
MARKLAND LOCKS AND DAM
Indiana, Kentucky and Ohio
Louisville District

Markland Locks and Dam are located on the Ohio River near Markland, Indiana. The project replaced five obsolete locks and dams. The dam provides a pool with a minimum channel depth of 9 feet, extending about 95 miles upstream to the Captain Anthony Meldahl Locks and Dam near Chilo, Ohio. The project provides a deeper and more stable pool in the important metropolitan Cincinnati harbor area. Navigation through this busy reach of the river is now possible with only one

lockage instead of the five formerly required. A substantial saving in transportation costs results, as well as a reduction in the cost of operating and maintaining the navigation facilities. Markland Dam is a non-navigable, gated structure. There are two parallel lock chambers, one 110 feet by 1,200 feet and the other 110 feet by 600 feet. The larger lock can accommodate in one lockage the large tows that have become increasingly popular in recent years. The lift of the locks between the normal upper and lower pools is 35 feet.

Construction started at Markland in March 1956 and traffic movement through the new locks began in May 1959. The upper pool was raised in stages according to a predetermined schedule late in 1962 and reached the new normal level early in 1963. The dam was completed in June 1964.

The States of Indiana and Kentucky contributed \$23,800 for modifications to the dam to permit construction of a highway bridge in the future. The Public Service Company of Indiana, which received a license from the Federal Power Commission to build a hydroelectric power plant at the site, contributed \$159,800 for work done to facilitate construction of the plant and completed construction of the 81,000 KVA power plant in January 1967. Federal costs through 30 June 1970 were \$61,800,000.



MARKLAND LOCKS AND DAM
PUBLIC SERVICE COMPANY OF INDIANA HYDROELECTRIC
POWER PLANT IS AT THE EXTREME LEFT

NEW CUMBERLAND LOCKS AND DAM
Ohio, Pennsylvania and West Virginia
Pittsburgh District

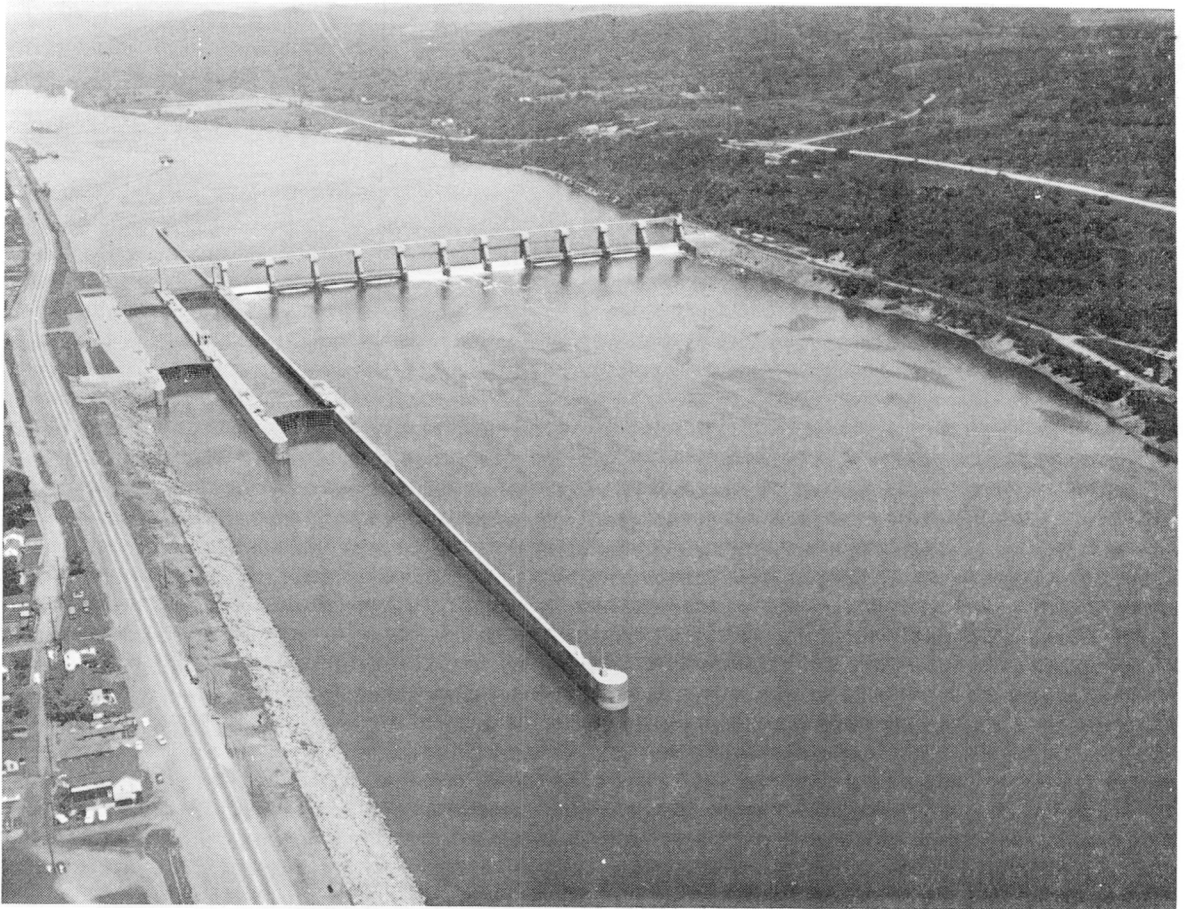
This completed locks and dam project is located at Stratton, Ohio, just upstream of New Cumberland, West Virginia. The New Cumberland slackwater navigation pool has a minimum channel depth of 9 feet and extends about 23 miles upstream to the existing Montgomery Island Locks and Dam. The project was completed in 1961 and replaced three obsolete locks and dams on the Ohio River.

The two parallel locks are located on the Ohio side of the river. The usable dimensions of the main lock chamber are 110 feet by 1,200 feet while

those of the auxiliary lock are 110 by 600 feet. The larger lock can accommodate, in one lockage, a larger-type Ohio River tow which formerly required uncoupling and reassembly in order to be locked through the replaced obsolete facilities. Use of such larger tows has progressively increased during recent years.

The navigation pool is maintained by a non-navigable, gated dam, 1,315 feet in length. The lift of the locks from lower pool to upper pool, at normal pool stages, is 20.5 feet.

The New Cumberland project was the first completed element in the overall improvement program for modernization of navigation facilities of the entire Ohio River. The total Federal cost is about \$38,900,000.



**NEW CUMBERLAND LOCKS AND DAM
FIRST COMPLETED UNIT OF OHIO RIVER
NAVIGATION MODERNIZATION PROGRAM**

PIKE ISLAND LOCKS AND DAM
Ohio and West Virginia
Pittsburgh District

The Pike Island Locks and Dam are located two miles upstream from Warwood, West Virginia. The project provides a pool with a minimum channel depth of 9 feet which extends upstream almost 30 miles to the New Cumberland Locks and Dam. The project replaced obsolete Ohio River Locks and Dams Nos. 10 and 11 and raised the level of a substantial portion of the pool of Locks and Dam No. 12.

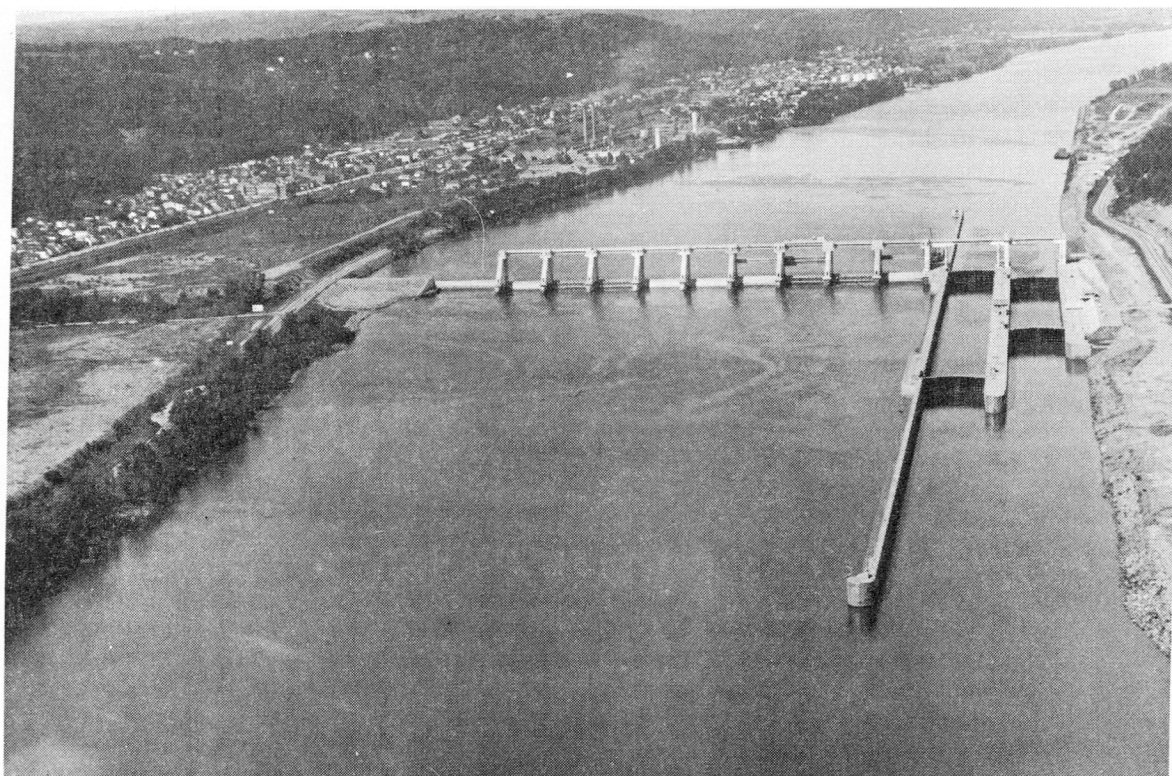
The two locks are located in Ohio County on the West Virginia side of the Ohio River. Dimensions of the main lock chamber are 110 by 1,200 feet and those of the auxiliary chamber are 110 by 600 feet. The dam is a non-navigable, gated structure 1,306 feet long. The initial lift of the locks, before Ohio River Dam No. 12 is removed, is 17.8 feet; however, after Ohio River Dams Nos. 12, 13 and 14 have been replaced by the Hannibal Locks and Dam project under construction

downstream, the lift will be increased to 21 feet.

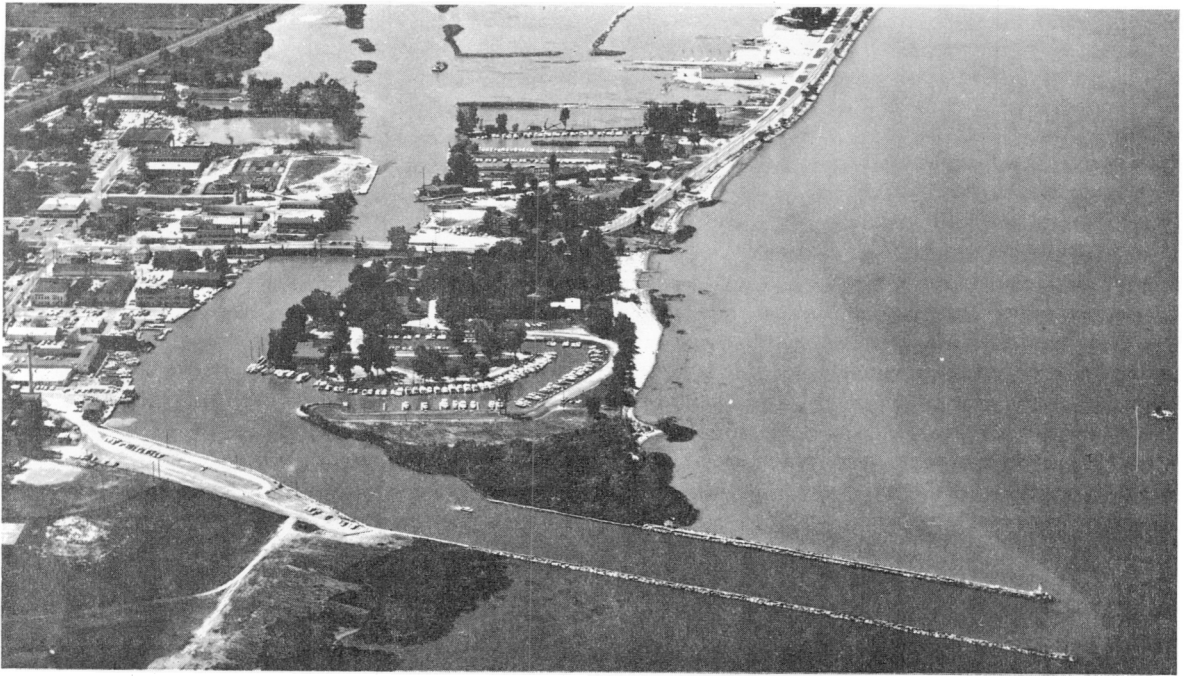
The project was completed in 1965 at an estimated Federal cost of \$56,600,000.

RACINE LOCKS AND DAM
Ohio and West Virginia
Huntington District

The Racine Locks and Dam are located on the Ohio River downstream from Letart Falls, Ohio, and Letart, West Virginia, and have replaced obsolete Ohio River Locks and Dams 21, 22 and 23. The dam provides a pool with a minimum navigable depth of 9 feet, extending 34 miles upstream to the Belleville Locks and Dam project. The two lock chambers are located side by side; the main lock is 110 feet by 1,200 in usable dimensions and the auxiliary lock 110 feet by 600 feet. The dam is a non-navigable, gated structure with a lift of 22 feet between normal lower and upper pools. The present estimated Federal cost is \$68,400,000. Construction was started in 1964 and the project was completed for operation in 1970.



PIKE ISLAND LOCKS AND DAM



PORT CLINTON HARBOR
SERVES RECREATIONAL CRAFT, COMMERCIAL
FISHING CRAFT AND INTER-ISLAND FERRIES

OHIO RIVER AT GALLIPOLIS Huntington District

This bank improvement project is located on the Ohio River at Gallipolis in Meigs County. It protects a 300-foot length of caving river bank which had receded to the point where several adjacent properties, some of which are of historic value, were endangered. The caving was deemed to be due in large measure to the erosion action of eddy currents caused by the location and maintenance of ice piers constructed by the United States near the shore at this location. The portion of the restored bank above elevation 540 consists of compacted pervious fill protected to elevation 555 from wave wash and scour by a three-foot layer of dumped rock. Below elevation 540 the restored river bank consists of gravel fill protected by a three-foot layer of rock.

The project was completed in May 1959 at a total Federal cost of \$65,900. Local interests furnished rights-of-way and performed the required sewer and utility relocations. Maintenance of the project is also a local responsibility.

PORT CLINTON HARBOR Detroit District

Port Clinton serves as recreational and

vacation area for many Ohioans each summer and also draws many people from neighboring states. Located on the southern shore of Lake Erie, Port Clinton Harbor is the home of many recreational craft, commercial fishing boats, and is the mainland connection to the islands of western Lake Erie, with ferry service to Put-In-Bay and Kelleys Island.

The harbor and city of Port Clinton are formed around the lower end of the Portage River. Jetties protecting the mouth and a channel from deep water in Lake Erie into the river have been constructed by the Corps of Engineers. The channel is 10 feet deep and almost a mile long with widths varying from 100 feet in the lake to 200 feet in the river section.

Port Clinton's commerce is light, averaging about 30,000 tons annually with fish, general cargo, and sand products being the principal items handled. The improvements by the United States were completed in 1893 at a cost of \$72,000. To date, the cost of maintaining the project has been about \$233,000.

PUT-IN-BAY HARBOR Detroit District

Rich in history, this area was the scene of the famous Battle of Lake Erie, September 20th 1813,



ROCKY RIVER HARBOR

when Commodore Oliver Hazard Perry captured the British fleet, and passed on news of the American victory with the statement "We have met the enemy and they are ours." Put-In-Bay is the site of Perry's Victory Monument, a lasting tribute to his naval success in the War of 1812.

Put-In-Bay Harbor is on the north side of South Bass Island, one of a number of islands that dot western Lake Erie. Ferries from Port Clinton and Sandusky are among the numerous facilities serving the harbor. There is also regular air transportation daily from the mainland. This busy harbor is within weekend cruising distance from the large metropolitan areas of Cleveland, Toledo and Detroit.

Commerce at the harbor which averages around 7,000 tons annually is confined to fruit shipment and receipts of general supplies — both in modest amounts.

The improvement by the Corps of Engineers, dredging along the harbor front completed in 1939 at a cost of about \$52,000, aided in the

development of this well-known resort area. The channel is 8 feet deep, 100 feet wide, and 1,600 feet long. Also included is a 14-foot deep flared approach channel to the ferry docks. The Federal cost for maintaining the improvements has been about \$7,000 to date.

ROCKY RIVER HARBOR Buffalo District

Rocky River Harbor is situated at the mouth of Rock River, in Cuyahoga County, on the south shore of Lake Erie, 7 miles westerly from Cleveland. It is used exclusively as a home port and port-of-call for recreational craft; there is no commercial navigation. Improvements by the United States, completed in 1941 at a cost of \$84,000, have provided an east entrance pier 900 feet in length and an entrance channel 100 feet wide and 10 feet deep, extending from the 10-foot depth contour on Lake Erie to a point 600 feet inside the inner end of the pier.

The 1965 River and Harbor Act authorized modification of the completed project to include

provision of an anchorage area, 10 feet deep near the inner end of the existing entrance channel and extension of the improved channel some 3,550 feet farther upstream in the river, the first 1,700 feet of the extension to be 100 feet wide and 8 feet deep, the balance to be 60 feet wide and 7 feet deep. The additional improvements were completed in 1968. Federal cost for the completed project was \$343,000. Related non-Federal cost was \$249,000.

Terminal facilities consist of private docks for pleasure boats. Approximately 940 such craft are permanently based at the harbor. One dock and a boat launching ramp, both operated by the Cleveland Metropolitan Board, are open to the public.

SANDUSKY HARBOR **Buffalo District**

Sandusky Harbor is located in Erie County in the southeastern portion of Sandusky Bay, 55 miles westerly from Cleveland. Improvements completed by the United States have provided the following: protective works at the mouth of the bay consisting principally of a stone jetty 6,000 feet long; a channel 400 feet wide, 26 feet deep, and about 11,000 feet long from deep water in Lake Erie into

the bay; deepened channels within the bay, 300–400 feet wide, aggregating about 20,000 feet in length, leading to the Norfolk and Western Railroad coal dock and the Sandusky waterfront. Depth in the main channel to the coal dock is 25 feet. Depths in a branch channel to the waterfront are 21–22 feet. Both channels terminate at a large turning basin near the inner end of the coal dock. The project was completed in 1965. In total, Federal costs for construction of improvements to the harbor were \$6,250,000.

The principal item of traffic is coal moving to American and Canadian ports. The railroad coal dock is the most extensive terminal facility, but there are numerous small public and private docks at which freight or passengers may be loaded or unloaded. Average annual commerce for the five-year period 1965 through 1969, amounted to 5,141,000 tons. Traffic in 1969 amounted to some 6,857,000 tons.

TOLEDO HARBOR **Detroit District**

In just a few short years Toledo has expanded from a fairly busy Great Lakes port to a center of world trade, and became one of the Nation's largest



TOLEDO HARBOR
ONE OF THE NATION'S BUSIEST PORTS

and busiest ports. The fast rate of growth of this harbor has been due mainly to the completion of the St. Lawrence Seaway. The harbor situated at the mouth of the Maumee River, which empties into western Lake Erie, handles about 40 million tons of commerce, annually. Coal shipments account for most of Toledo's commerce. Overseas general cargo, and shipments of grain and iron ore have increased considerably with the opening of the Seaway.

Toledo Harbor improvements by the Corps of Engineers began in 1866 and have continued through the present, keeping pace with the city's growth and development. Most work by the United States has consisted of channel deepening and widening. To take advantage of the larger, deeper

draft lake carriers and ocean-going vessels, the Corps of Engineers recommended and Congress authorized, in 1960, additional deepening to permit 25.5-foot draft navigation. Now complete, this latest improvement which includes construction of new turning basins provides Toledo with channel depths equal to those on the St. Lawrence Seaway. The channel is nearly 25 miles long, 7 miles in the river and the remainder in Maumee Bay and Lake Erie, and ranges in width from 500 feet in the bay to 200 feet in the river.

To date the Federal costs for improvement of Toledo Harbor amount to about \$17,200,000. About \$14,300,000 has been spent to date maintaining the authorized channel depths and widths.

FLOOD CONTROL PROJECTS COMPLETED

The projects for flood control completed by the Corps of Engineers in Ohio include eight local flood protection projects in the Ohio River basin portion of the state and one in the Lake Erie portion of the state. There are 23 other completed reservoirs that contribute to flood reduction, but, since they have added functions, they are listed in the section "Multiple Purpose Projects Completed."

The entire group of completed flood control projects has made a major contribution toward reduction of flood damages. Flood control benefits from their operation to date aggregate over \$102.5 million. Completed multiple-purpose projects contribute additional flood control benefits. The reservoirs, in addition to their flood control benefits, also have contributed substantial pollution abatement benefits. Recreational use of the completed reservoirs is extensive. Descriptions of the individual projects follow.

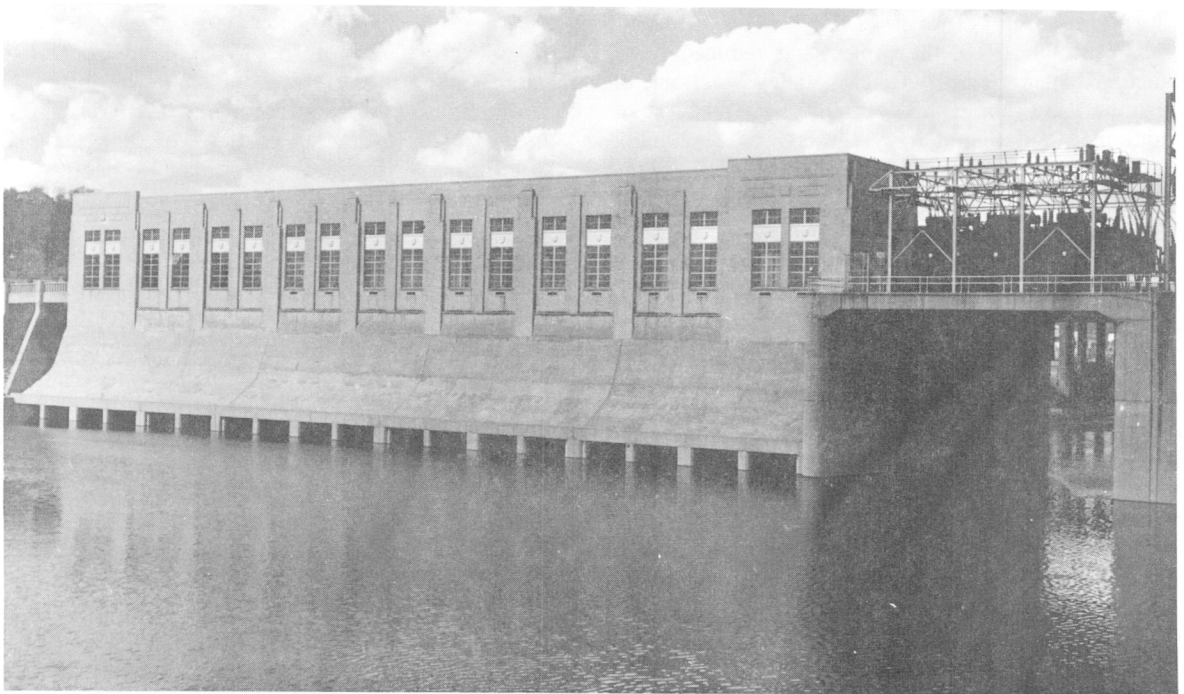
CINCINNATI (MILL CREEK VALLEY) LOCAL PROTECTION PROJECT Louisville District

This project is located at the mouth of Mill Creek, a tributary of the Ohio River, at Cincinnati

in Hamilton County. It consists of a barrier dam across the creek near its mouth together with earth-levee and concrete-wall closure sections to high ground. The barrier dam has outlet works to pass creek discharges during non-flood periods. During floods on the Ohio River, the outlet works are closed and the flow of Mill Creek is discharged by six pumps, each with a rated capacity of 1,500 cubic feet per second. Provision also is made for the disposal of sewage and internal drainage from the protected area during flood periods. Openings are provided in the walls to permit unrestricted movement of traffic during non-flood periods. These are closed by gates during times of flood. The protected area, about 3,000 acres in extent, has a population of about 40,000 and is the site of extensive industrial development.

Acting alone, the project would protect the Mill Creek Valley section of Cincinnati against backwater from an Ohio River flood stage as great as that of January 1937, the maximum of record.

The project was completed for beneficial use and turned over to local interests for maintenance and operation on 1 March 1948. The cost of the project was \$11,500,000 of which \$10,200,000 was



**MILL CREEK PUMPING STATION
NORMAL FLOW OPENING IS AT RIGHT**



**IRONTON LOCAL PROTECTION PROJECT
FLOODWALL IN FOREGROUND AND LEVEE BEYOND BRIDGE**

Federal and \$1,300,000 was non-Federal.

Through 1970, the project has reduced flood damages in the Mill Creek Valley section of Cincinnati by about \$32,600,000. The project is maintained and operated by the city of Cincinnati. (See also "West Fork of Mill Creek Lake" in the section "Multiple-Purpose Projects Completed.")

**IRONTON LOCAL PROTECTION PROJECT
Huntington District**

The project is located at Ironton in Lawrence County. It comprises 5.8 miles of earth levees and 1.0 mile of concrete walls which afford protection against Ohio River floods to an area of 1,040 acres. The protection works contain 19 openings to permit normal traffic during non-flood periods. These are closed by gate structures during floods. Ten pump stations and a 2,300-foot diversion channel have been provided to dispose of sewage and drainage in the protected area during flood periods.

The project acting alone would protect the city of Ironton against a flood equal in magnitude to that of January 1937, the maximum of record. However, considering the effect of upstream reservoirs, protection would be provided against

floods greater than the maximum of record.

Section 205 of the 1968 Flood Control Act modified the project to provide for the installation of aluminum closure structures at Gates No. 10, 17 and 18 at an estimated cost of \$62,000. Plans and specifications for this work are scheduled for completion late in FY 1971.

The project was completed and turned over to local interests for maintenance and operation in June 1943. The total cost of the project to date is \$3,240,000, of which \$2,570,000 was Federal and \$670,000 non-Federal. To date, the project has reduced flood damages at Ironton by about \$29,100,000.

**LACARNE-CAMP PERRY
LOCAL PROTECTION PROJECT
Detroit District**

The project is on Lake Erie in Ottawa County. It comprises 3,250 feet of levee along Lake Erie, raising 880 feet of existing concrete wall along Lake Erie, and a 3,650 foot tie-back dike. This project was constructed to prevent flooding and beach erosion. The project was completed in 1954 at a Federal cost of \$150,000.

MASSILLON LOCAL PROTECTION PROJECT Huntington District

The project is located on the Tuscarawas River at Massillon, in Stark County. It comprises 2.4 miles of channel widening and deepening, 0.8 mile of new channels, relocation of 6 miles of railroad lines, new railroad and highway bridges, 3.0 miles of earth levees, 200 feet of concrete walls, two pressure conduits, and four pump stations to dispose of sewage and drainage from the protected area during floods. There are two gated openings on railroad lines and one on a highway to permit normal traffic during non-flood periods. The protected area is about 630 acres in extent. The project affords protection for the city of Massillon against the project flood which, in this instance, is the maximum flood which would be caused by the occurrence of a storm about 13 percent greater in magnitude above Massillon than that which occurred during March 1913, the greatest flood of record at this location.

The project was completed for beneficial use in October 1951 at a total first cost of \$8,140,000 to the United States and \$476,000 to local interests. As provided by law, the improved channel is maintained by the United States. Operation and maintenance of the remaining features of the

project are responsibilities of the city of Massillon. Damages prevented to date are estimated to total \$5,620,000.

MT. VERNON LOCAL PROTECTION PROJECT Huntington District

The project is located on the Kokosing River at Mt. Vernon in Knox County. It comprises 23,200 feet of snagging and clearing of river channel through Mt. Vernon. The channel and banks were flush-cleared of all timber, snags, and silt for a maximum distance of 250 feet on either side of the centerline of the stream where over-bank clearing was feasible. Other improvements include the provision of a large culvert near the West High Street highway bridge. Also, the Pennsylvania Railroad spur bridge over Dry Creek at its confluence with the Kokosing River has been raised three feet.

This project is complementary to the North Branch Reservoir Project (see section on "Flood Control Projects Under Way") and will provide a high degree of protection against the flood waters of the Kokosing River when the North Branch Project is completed.

The project was completed and turned over



**MASSILLON LOCAL PROTECTION PROJECT
LEVEE AND PUMP STATION AT RIGHT
ADJOINING IMPROVED CHANNEL OF TUSCARAWAS RIVER**



NEWARK LOCAL PROTECTION PROJECT CHANNEL IMPROVEMENT

to local interests for maintenance and operation in February 1966. The total project cost was \$260,000, of which \$160,000 was Federal and \$100,000 was local. Damages prevented to date are estimated at \$66,000.

NEWARK LOCAL PROTECTION PROJECT Huntington District

The project is located on the Licking River at Newark in Licking County. As originally constructed, it comprises 6.0 miles of channel widening and deepening, 1.0 mile of earth levee, one pump station, and one sump-pump to dispose of sewage and drainage from the area protected by the levee. The protection works contain three levee openings to facilitate traffic movement during non-flood periods.

The Newark improvement is designed to protect about 560 acres in the city against a flood having a discharge about 20 percent greater than is estimated to have occurred in 1913.

Maintenance of the channel is the responsibility of the United States. Maintenance and operation of the remaining features of the project are responsibilities of local interests. The project was completed for beneficial use in November 1941.

The present estimated cost is \$846,000, of which \$21,000 is cost to local interests. Flood damages to date at Newark have been reduced about \$2,720,000.

At the time the project was built, short end sections of the Raccoon Creek and North Fork arms of the levee were omitted from construction due to rights-of-way difficulties encountered. The flood of January 1959 caused extensive damage in the city and stressed the need for remedial channel work, extension of the levee, the addition of one pump station, and modification of the levee openings. These changes were completed in 1963 at a cost of \$323,000. Further extension of the protection works is authorized and would consist of diverting Log Pond Run, interior drainage improvements to the completed project, and modifications of the existing North Fork Channel.

PORTSMOUTH-NEW BOSTON LOCAL PROTECTION PROJECT Huntington District

The project is located along the Ohio and Scioto Rivers at Portsmouth and New Boston in Scioto County. It comprises 4.0 miles of earth levees and 4.1 miles of concrete walls. Twelve pump stations are provided to dispose of sewage and

drainage in the protected area during the floods. The works contain 16 openings and 2 ramps over the protection works to provide for normal traffic during non-flood periods.

The project affords protection to some 3,400 acres in the adjacent cities of Portsmouth and New Boston against a flood equal in magnitude to that of January 1937. Moreover, it is supplemented by the coordinated system of reservoirs on Ohio River tributaries above the project, which will reduce Ohio River flood crests and will give additional protection to the extent of such reduction.

The project was completed and turned over to local interests for maintenance and operation in May 1950. However, with the aid of emergency measures, flood control operations have been possible since 1945. The cost of the project as originally completed was \$9,825,000 to the United States and \$525,000 to local interests. Floodwall rehabilitation work essentially completed in 1964 amounted to an additional \$140,000. Flood damages prevented to date amount to about \$28,800,000.

ROSEVILLE LOCAL PROTECTION PROJECT Huntington District

The project is located on Moxahala Creek at

and below the village of Roseville in Muskingum and Perry Counties, about 10 miles southwest of Zanesville. It is a combined channel improvement and levee protection project, comprising 1.4 miles of channel rectification, 1.0 mile of earth levee, one pump station for disposal of internal drainage during floods, and necessary bridge alterations, including relocation of a railroad bridge and remedial measures at two highway bridges. The project would protect the village of Roseville from a design flood having a peak discharge 33 percent greater than the maximum flood of record, June 1950, with a three-foot freeboard on the levee.

The total first cost of the project was \$910,000 to the United States and \$62,000 to local interests, a total of \$972,000. In addition, Muskingum County and the village of Roseville completed prior work applicable to the project by replacing an old bridge with one having greater capacity to pass high stream flows and by channel improvement to obtain a measure of relief from flood damages prior to completion of the more comprehensive project. The project was completed in October 1960. Maintenance of the improved and relocated channel of Moxahala Creek is the responsibility of the United States. Operation and maintenance of all other works are local responsibilities. Flood damages prevented by the project to date amount to an estimated \$900,000.



**PORTSMOUTH LOCAL PROTECTION PROJECT
FLOODWALL ALONG OHIO RIVER (FOREGROUND)
AND LEVEE ALONG SCIOTO RIVER (LEFT)**

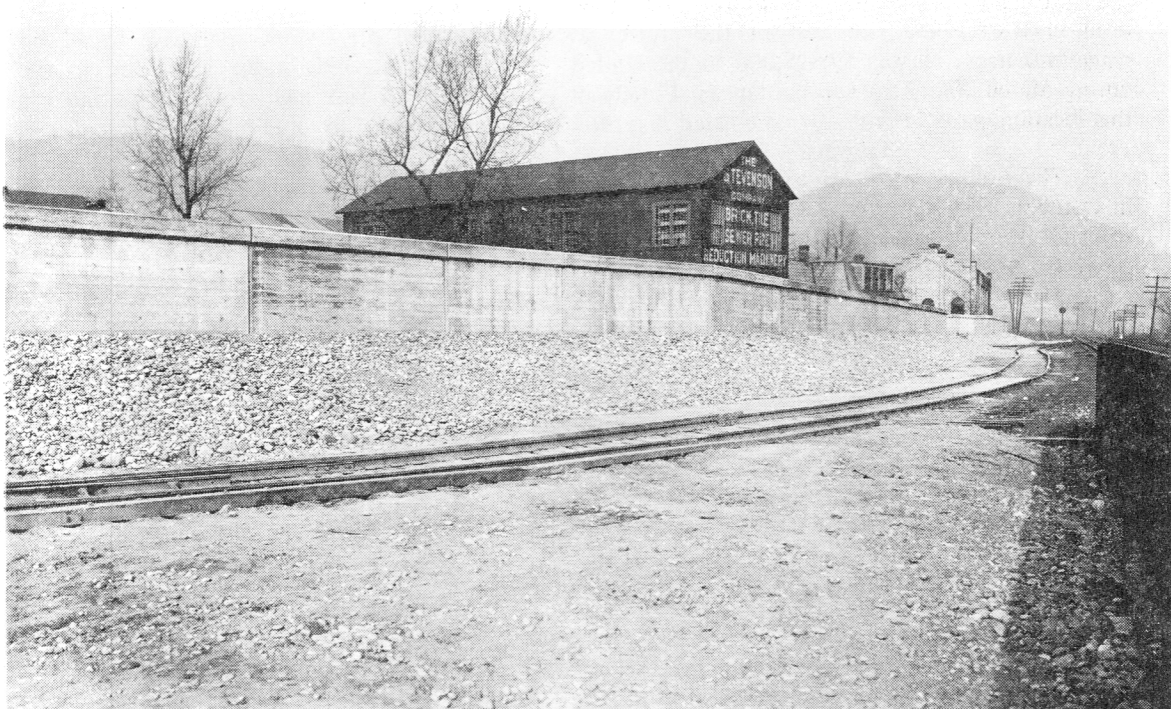
WELLSVILLE LOCAL PROTECTION PROJECT

Pittsburgh District

The project is located on the Ohio River at Wellsville, in Columbiana County. The protection works comprise a system of earth levees and concrete walls. Interior drainage facilities are provided to dispose of sewage and drainage from the protected area during floods. Openings through the protection structures permit normal passage of highway and rail traffic during non-flood periods. These openings are closed by prepared barricades or stop logs during floods. The project affords

protection for a 70-acre area against a flood equal in magnitude to the maximum of record, with a freeboard of three feet. The works are supplemented by the coordinated system of reservoirs on the Ohio River tributaries above the city.

The project was completed and transferred to the city of Wellsville for operation and maintenance in 1942. The total project cost was \$755,000 of which \$642,000 was Federal and \$113,000 was local. Flood control benefits to date amount to \$2,700,000.



WELLSVILLE LOCAL PROTECTION PROJECT

MULTIPLE-PURPOSE PROJECTS COMPLETED

Twenty-two multiple-purpose projects are completed in Ohio. In addition, the Shenango River Reservoir extends into Ohio although the dam is located in Pennsylvania. Benefits from flood protection alone amount to nearly \$337 million. Substantial additional benefits are attributable to the increased supply of water made available by these reservoirs. As at other Corps of Engineers projects, recreational benefits are also significant. Descriptions of these projects are presented in subsequent paragraphs.

BERLIN LAKE Pittsburgh District

The dam for this multiple-purpose project is located on the Mahoning River about 35 miles upstream from Warren. The lake area extends through Mahoning, Portage, and Stark Counties and the dam controls the runoff from a drainage area of 249 square miles. The project has been operated and maintained by the Corps of Engineers since 1943. The spillway portion of the dam is mass concrete, controlled by four steel tainter gates over part of its length, and stands 96 feet high above streambed. Abutments of rolled-earth fill flank the spillway. The dam is 5,750 feet long at the top.

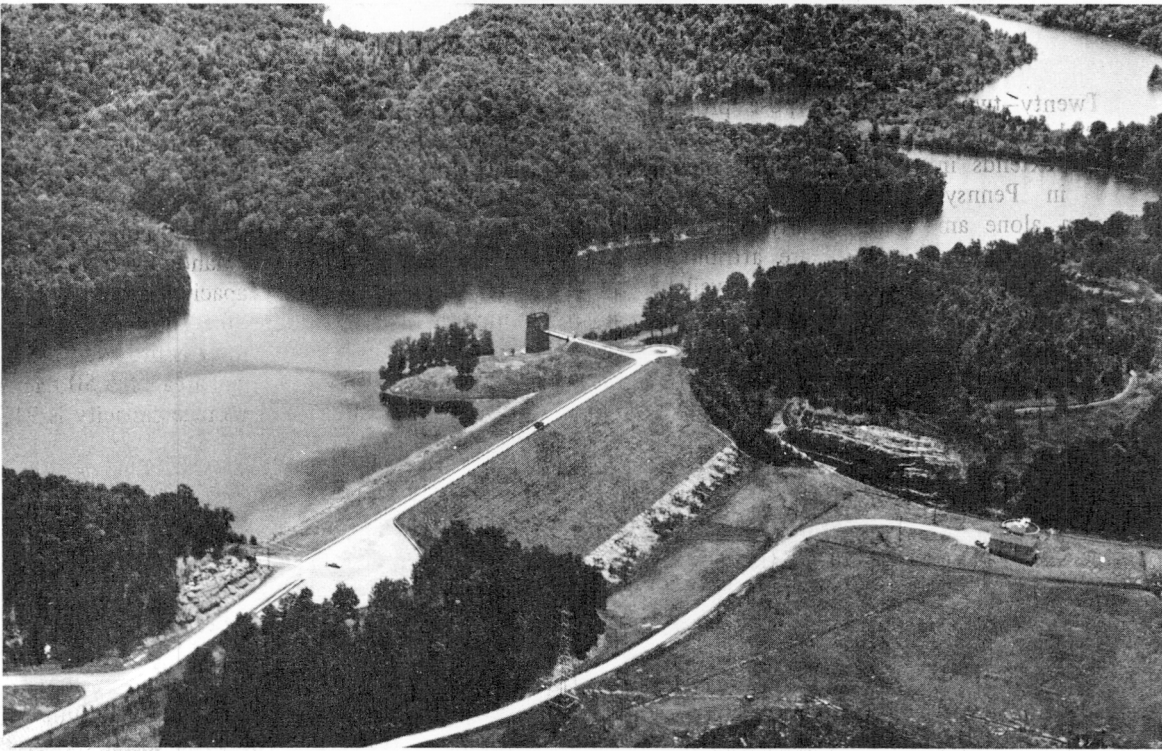
A permanent pool with a surface of 240 acres contains 1,800 acre-feet of storage. Above this pool, storage capacity of 33,600 acre-feet in winter and 56,600 acre-feet in summer is provided for the storage of excess runoff for subsequent release to increase low flow in the Mahoning River and for water supply. Storage capacity amounting to a minimum of 32,800 acre-feet in the summer and 55,800 acre-feet in the winter is provided for flood control. The reservoir has an area of 5,500 acres at reservoir-full level. Total storage capacity is 91,200 acre-feet.

Water can be pumped from Berlin Lake through a pipeline to the Meander Creek Reservoir of the Mahoning Valley Sanitary District, when needed, to augment the yield of that reservoir. Pumping facilities and the pipeline were provided by the Sanitary District.

The project is operated as a unit of a coordinated reservoir system for flood control in the Mahoning, Beaver, and Ohio River valleys and for low-water regulation for the highly industrialized Mahoning River valley and beyond. Benefits from low-water regulation provided by the reservoir have never been evaluated but are



BERLIN DAM
SHOWING CONCRETE SPILLWAY SECTION



TOM JENKINS DAM AND BURR OAK LAKE

substantial, including improvements in industrial and domestic water supplies, temperature reductions in cooling water, and reduction in the intensity of organic pollution.

Under agreement with the United States, the State of Ohio is developing and managing the reservoir pool and adjacent land areas for conservation of fish and wildlife. Federal recreational developments are continuing in the Mill Creek Recreation Area.

The total estimated cost of the project, including recreational facilities, all Federal, is \$8,460,000. Flood control benefits amounting to about \$85,800,000 have been provided by the project since its completion. Recreational visitation at the project for 1969 was 898,000.

**BURR OAK LAKE
(TOM JENKINS DAM)
Huntington District**

Burr Oak Lake impounded by Tom Jenkins Dam is located in Athens and Morgan Counties in the Hocking River Basin, on East Branch of Sunday Creek. The dam, which controls the runoff from a drainage area of 33 square miles is of earth-fill construction, 84 feet in maximum height, with a

top length of 944 feet. An uncontrolled spillway is located near the left abutment. A minimum pool is maintained at elevation 710 with a surface area of 394 acres. The water supply pool between elevations 710 and 721 contains 5,800 acre-feet of storage with an area of 664 acres at elevation 721. Above this pool, to elevation 740, a storage capacity of 17,600 acre-feet is provided for the temporary storage of flood flows. At full pool, elevation 740, the reservoir has an area of 1,192 acres.

The project is operated as a unit of a coordinated system for flood protection in the Sunday Creek, Hocking, and Ohio River valleys. The reservoir includes storage that is being utilized for water supply in the Sunday Creek valley, a feature for which the State of Ohio contributed the cost or its equivalent in reservoir lands. The Ohio Department of Natural Resources also is developing the reservoir area for recreational activities and beneficial uses of agricultural lands, forests, and fish and wildlife resources. Public attendance at the project during 1969 totaled about 945,000 visitors. The State of Ohio is contributing annually the pro-rata share of maintenance and operation costs applicable to the water supply features of the project.

The estimated cost of Tom Jenkins Dam was

\$2,130,000 to the United States and \$785,000 to local interests. During the period since completion of the dam in 1950, the reservoir has provided flood control benefits estimated to be in excess of \$2,600,000. The water supply features of the project are under the control of the Ohio Department of Natural Resources and benefits being realized from this function have not been evaluated.

DEER CREEK LAKE Huntington District

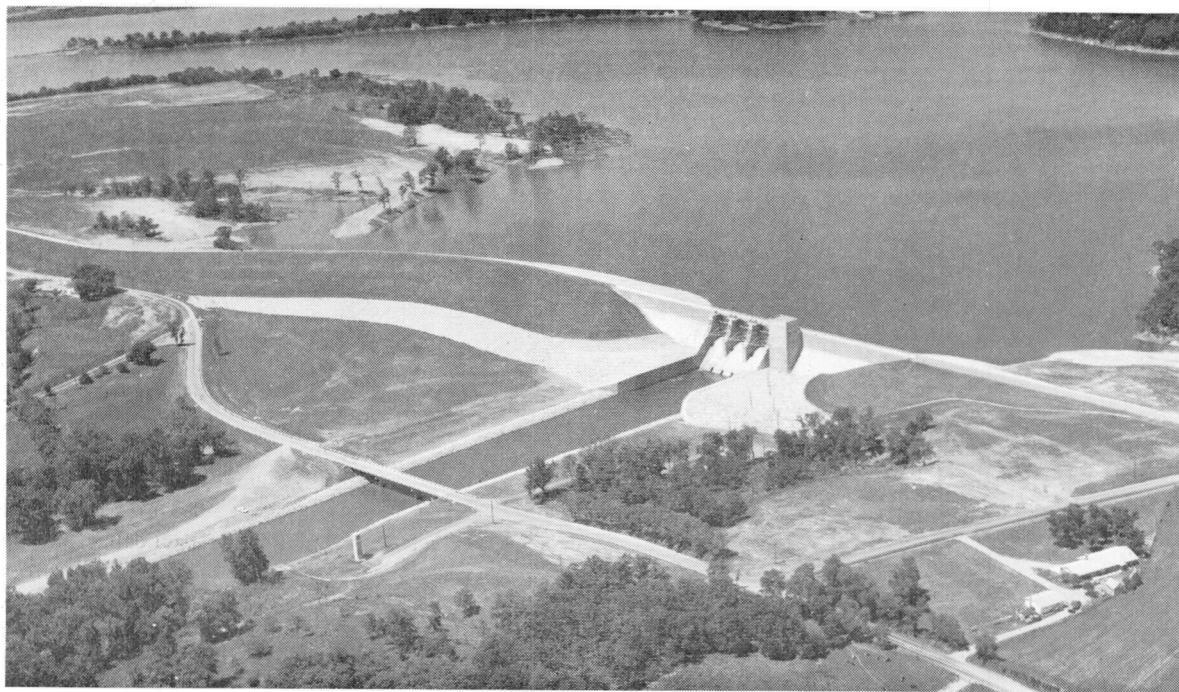
The Deer Creek Lake is located in the Scioto River Basin, 21 miles above the mouth of Deer Creek, in Pickaway and Fayette Counties. The dam controls the runoff from a drainage area of 278 square miles and has a maximum height of 93 feet and a total crest length of 3,880 feet. A gate-controlled concrete gravity spillway section is incorporated in the earth-fill structure. A minimum pool with a surface area of 727 acres is maintained at elevation 796 feet above mean sea level. A seasonal pool at elevation 810 is provided with a surface area of 1,277 acres for recreational purposes. Above this pool to elevation 844, a storage capacity of 96,120 acre-feet in the winter and 81,510 acre-feet in the summer is reserved for the temporary storage of flood flows. At full pool, elevation 844, the reservoir has a surface area of 4,046 acres.

The project is operated as a unit of a coordinated system for flood protection in the Deer Creek and Scioto and Ohio River valleys. Project plans include development of the recreational potential of the lake. The estimated Federal cost is \$19,600,000. Flood damages prevented through FY 1970 are estimated at \$877,000.

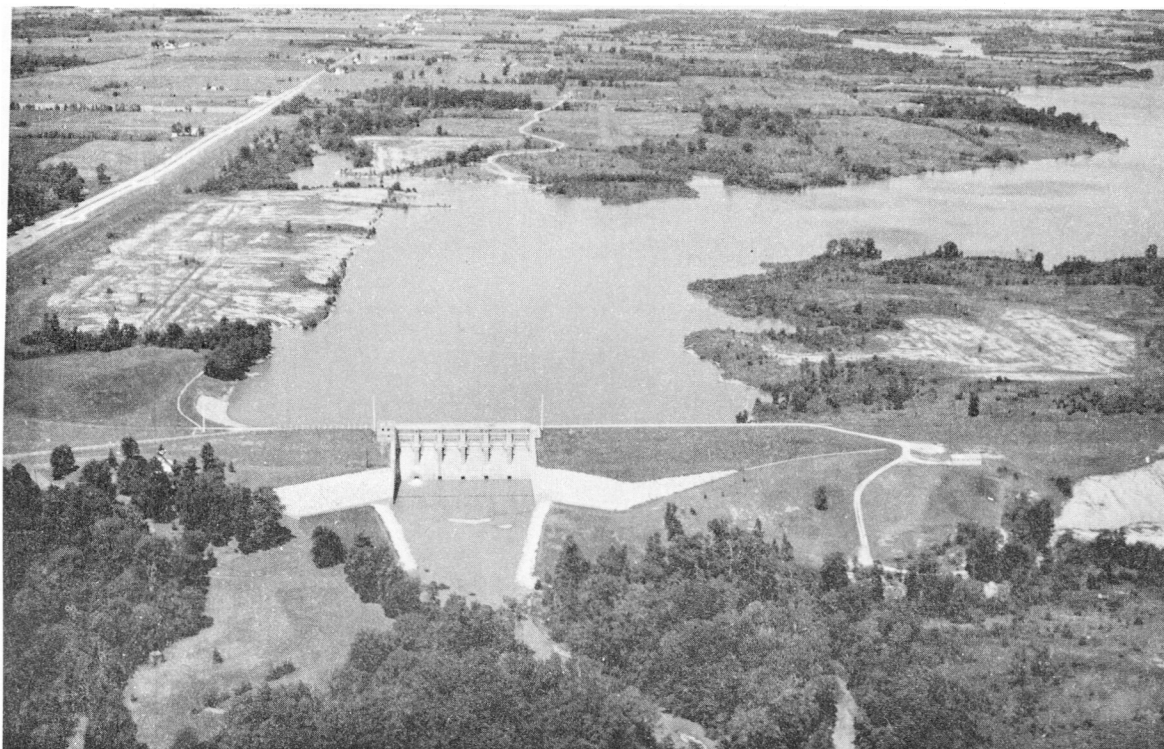
DELAWARE LAKE Huntington District

Delaware Lake is located in Delaware, Marion, and Morrow Counties in the Scioto River Basin, on Olentangy River, upstream from Delaware. The dam which controls the runoff from a drainage area of 381 square miles is earth-fill construction, 92 feet in maximum height and 18,600 feet in length. A controlled concrete gravity spillway is located in the channel section of the dam. The town of Waldo, which lies partially within the project, is protected from reservoir flooding by an earth levee and two pump stations.

In addition to effecting reductions in flood flows on the Olentangy and Scioto Rivers, the project is operated as a unit of a coordinated reservoir system designed to reduce extreme floods on the Ohio River and, in lesser degree, to contribute to the reduction of floods on the lower Mississippi River.



DEER CREEK DAM



DELAWARE DAM

A minimum pool is maintained in the winter at elevation 910 with a surface area of 950 acres. A seasonal pool varying in area from 950 to 1300 acres normally is maintained between elevation 910 and 915 feet above mean sea level. This pool is used to regulate low water discharge to insure a minimum flow of at least 5 cubic feet per second for water supply purposes in Olentangy River below the dam and to provide additional flow regulation between 1 July and 20 September each year to aid in controlling pollution of the Scioto River below Columbus, Ohio. Storage capacity available for temporary impoundment of flood flows amounts to 123,600 acre-feet during the winter and 118,000 acre-feet during the summer season. At full pool elevation, 947 feet above mean sea level, the reservoir has a surface area of 8,700 acres.

To the extent consistent with the primary purposes of the project, the reservoir area is being developed by the Ohio Department of Natural Resources for recreational activities and beneficial uses of lands, forests, and fish and wildlife resources. The project has been in operation since 1951. Visitors to the project during 1969 totaled about 1,340,000 persons.

First cost of the project, all Federal, was \$7,630,000. Flood damages prevented by the

project operation to date are about \$27,100,000 mostly due to stage reductions effected during the severe flood of January 1959.

DILLON LAKE Huntington District

Dillon Lake is located in the Muskingum River Basin, on Licking River 6 miles above Zanesville, in Muskingum and Licking Counties. The project, completed in 1961, controls runoff from a drainage area of 748 square miles. The earth-fill dam has a maximum height of 118 feet, is 1,400 feet long, and has an uncontrolled spillway located in the left abutment. A minimum pool is maintained at elevation 734 feet above mean sea level. It has a surface area of 1,330 acres. Above this pool, to elevation 790, a storage capacity of 261,000 acre-feet is available for temporary storage of flood flows. At full pool, elevation 790, the reservoir would have an area of 10,280 acres.

The project is being operated as a unit of the coordinated reservoir system for flood protection in the Licking, Muskingum, and Ohio River valleys and supplements the completed Muskingum River Reservoir system described in a subsequent paragraph in this section. This system, together with other reservoirs in various locations in the Ohio

River Basin, is designed to reduce flood crests on the Ohio River and to contribute to the reduction of flows on the lower Mississippi River.

Administration and operation of all project lands, except those required for operating purposes, and including four recreation sites developed by the Corps of Engineers, have been transferred to the Ohio Department of Natural Resources. Public attendance at Dillon Lake during 1969 was in excess of 1,040,000.

The total estimated cost of the project, which was completed in 1961, is \$30,600,000. Flood control benefits derived to date from operation of the reservoir are estimated to be about \$19,000,000.

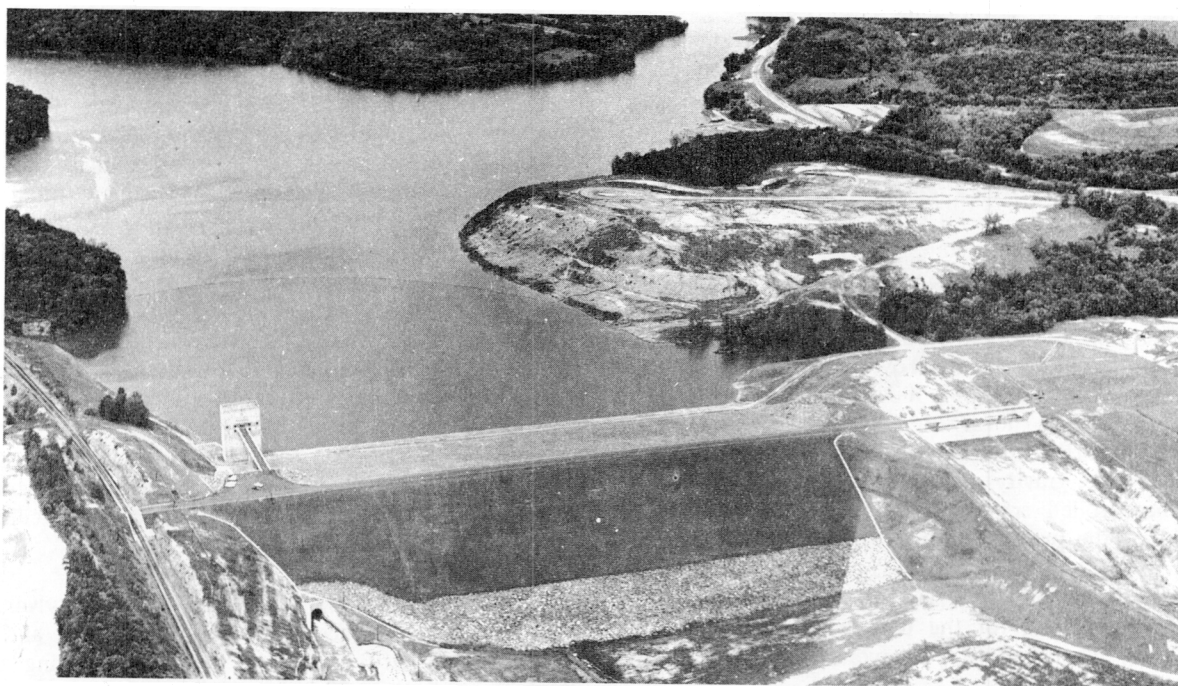
MOSQUITO CREEK LAKE **Pittsburgh District**

The dam for this multiple-purpose project is located in the Mahoning River Basin, on Mosquito Creek, 9 miles above Niles, in Trumbull County.

The project entirely in Trumbull County, controls the runoff from a drainage area of 97 square miles. It was completed for use in 1944 and has since been operated and maintained by the Corps of Engineers. The dam is a rolled-earth fill

embankment, 5,650 feet long at the top and 47 feet in maximum height above the streambed, with outlet facilities through the dam. An uncontrolled, natural waterway would discharge overflow from the reservoir when or if the necessity develops. A permanent pool is provided with an area of 700 acres and a storage capacity of 2,000 acre-feet. Above this pool, storage of 11,000 acre-feet is reserved for water supply available for purchase by the city of Warren under terms of a contract between the United States and the city. In addition, storage capacity of 58,100 acre-feet in winter and 69,400 acre-feet in summer is provided for storage of excess runoff for subsequent release to increase low flow in the Mahoning River. Remaining reservoir storage capacity, amounting to a minimum of 21,700 acre-feet in the summer and a minimum of 33,000 acre-feet in the winter, is reserved for flood control. The reservoir has an area of 8,900 acres at reservoir-full level. Total storage capacity is 104,100 acre-feet.

The project is operated as a unit of a coordinated reservoir system for flood control in the Mahoning, Beaver, and Ohio River valleys and for low-water regulation for the highly industrialized Mahoning River valley and beyond. Benefits from low-water regulation provided by the project are substantial. They include improvements in industrial and domestic water supplies,



DILLON DAM

temperature reductions in cooling water and reduction in the intensity of organic pollution.

Under agreement with the United States, the State of Ohio is developing and managing the reservoir pool and adjacent land areas for conservation of fish and wildlife and for public park and recreational purposes.

The cost of the completed project is \$4,035,000. The project has been effective in providing flood control benefits amounting to about \$16,800,000 since its completion. Recreational visitation at the project for 1969 was 1,200,000.

MUSKINGUM RIVER RESERVOIR SYSTEM Huntington District

The Muskingum River Reservoir System consists of 14 projects located on tributaries of the Muskingum River, as follows:

Lake	Stream	Nearest Town
Atwood	Indian Fork	New Cumberland
Beach City	Sugar Creek	Beach City
Bolivar	Sandy Creek	Bolivar
Charles Mill	Black Fork	Mifflin
Clendenning	Brushy Fork	Tippecanoe
Dover	Tuscarawas River	Dover
Leesville	McGuire Creek	Leesville
Mohawk	Walhonding River	Nellie
Mohicanville	Lake Fork	Mohicanville
Piedmont	Stillwater Creek	Piedmont
Pleasant Hill	Clear Fork	Perrysville
Senecaville	Seneca Fork	Senecaville
Tappan	Little Stillwater Cr	Tappan
Wills Creek	Wills Creek	Conesville

The Muskingum River Reservoir System controls a drainage area of 4,267 square miles. Construction of the dams was completed in 1938. The present estimated cost of the project, including some channel improvement work not yet completed, is \$41,000,000 to the United States and \$5,250,000 to local interests. Thirteen of the dams are of earth-fill construction while Dover Dam is a concrete gravity structure. Each dam has an uncontrolled spillway. Minimum pools provided at 11 of the projects have a combined area of 16,380 acres. In addition to the minimum pools, a total storage capacity of 1,327,800 acre-feet is provided by the system for the temporary storage of flood flows. When full, the reservoirs would have a total water surface area of 77,620 acres.

The projects are operated as units of a

coordinated reservoir system for flood protection in the Tuscarawas, Walhonding, Muskingum, and Ohio River valleys. The coordinated system of reservoirs is also operated to reduce floods on the Ohio River and to contribute to the reduction of floods on the lower Mississippi River.

The Muskingum Watershed Conservancy District operates the reservoir areas for recreational activities and beneficial uses of agricultural lands, forests, and fish and wildlife resources. Public attendance at the reservoirs during 1969 totaled over five million visitors. It is estimated that the 14 reservoirs of the Muskingum system have reduced flood damages by approximately \$182,000,000 to date. In addition to the system described above, one other project, Dillon, located on the Licking River in the Muskingum Basin, was completed for operational purposes in 1961. This project, authorized as an individual unit by the Flood Control Act of 1938, is described separately in this section of the pamphlet.

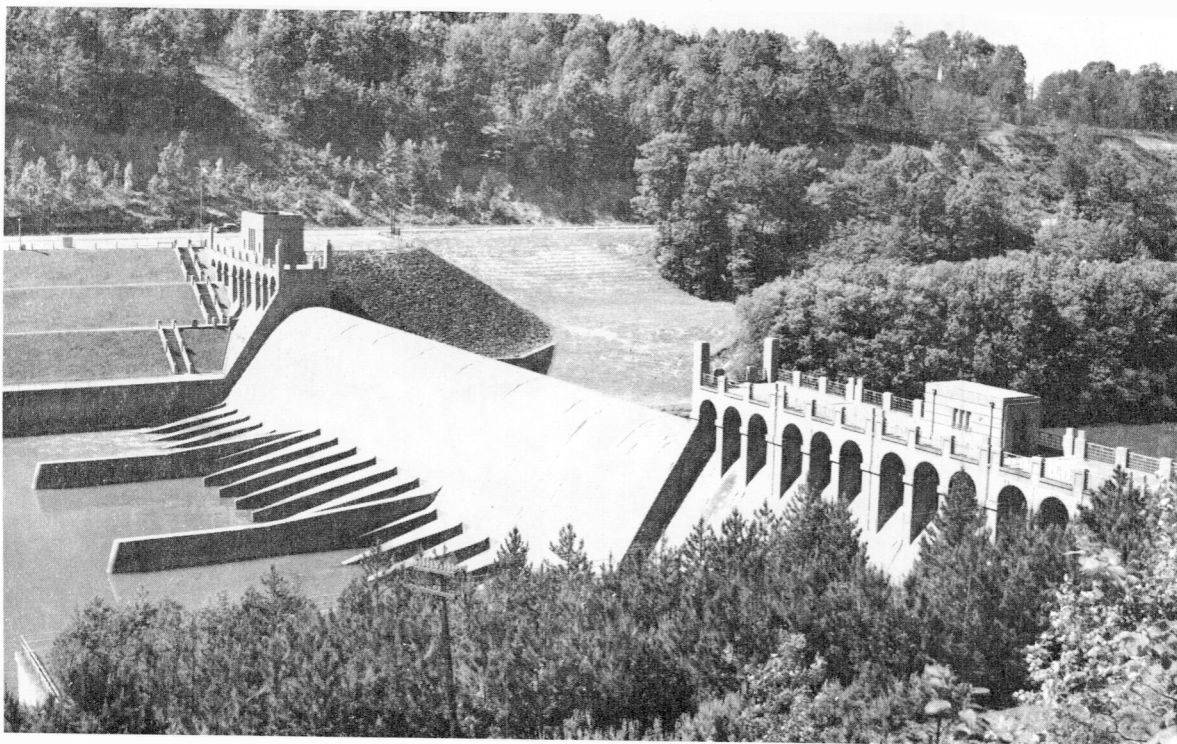
SHENANGO RIVER LAKE Pittsburgh District

The Shenango River Lake area is situated primarily in the Shenango River valley in Pennsylvania and in Pymatuning Creek valley in Pennsylvania and Ohio. The dam site is located on the Shenango River about one mile above Sharpsville in Mercer County, Pennsylvania. The Pymatuning Creek arm in Ohio is in Trumbull County and extends from the state line north to about the Trumbull County-Ashtabula County line. Runoff is controlled from a total drainage area of 589 square miles, including 431 square miles of intermediate area between existing Pymatuning Dam, owned and operated by the Commonwealth of Pennsylvania, and Shenango Dam.

The dam is of the concrete-gravity type, 68 feet high. Normal flows are discharged through gated conduits located in the uncontrolled center spillway section of the dam.

Extensive highway and railroad relocations have been completed. Some public use facilities have been constructed.

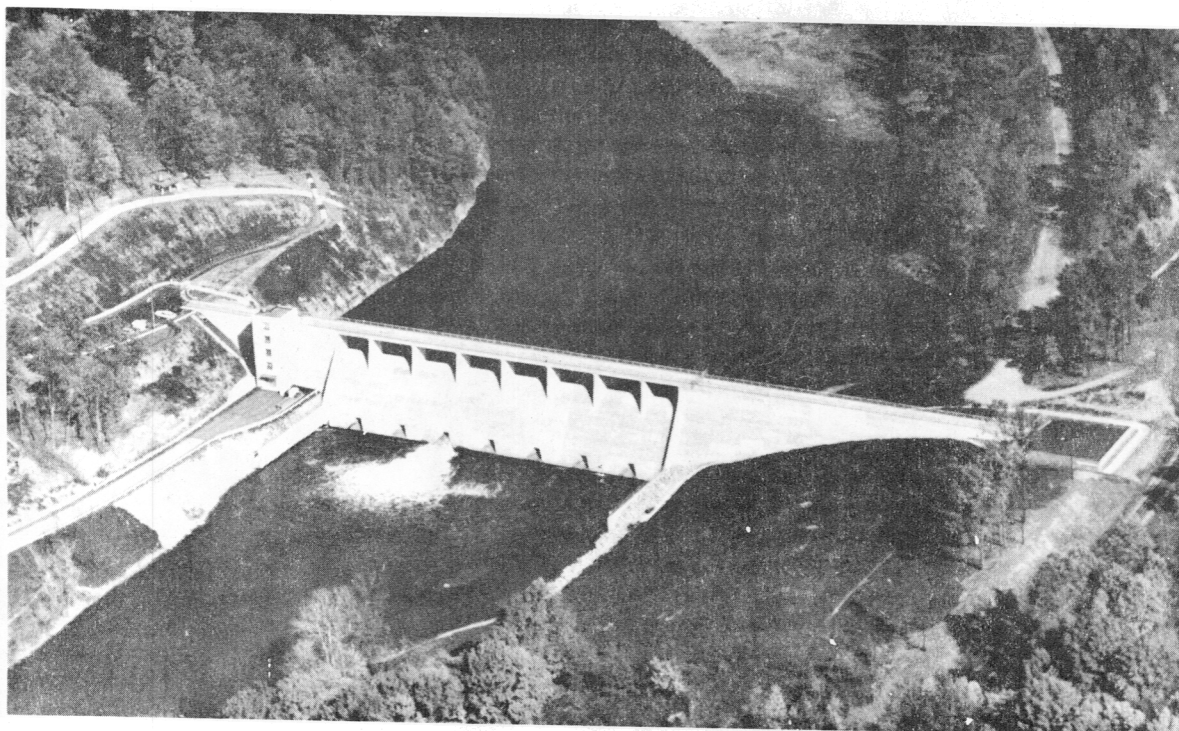
The minimum pool (all in Pennsylvania) comprises a surface area of 1,910 acres and a storage capacity of 11,500 acre-feet. During the spring months, 29,900 acre-feet of inflow is impounded for release during the summer months to supplement the river discharge as regulated by



DOVER DAM



RECREATION AT PLEASANT HILL LAKE



SHENANGO DAM

the existing Pymatuning Dam. The remaining capacity of the reservoir, 151,000 acre-feet in summer and 180,900 acre-feet in winter, is available for storage of flood flows. At the reservoir—full level, elevation 919 feet, the reservoir has a total capacity of 192,400 acre-feet covering an area of 11,090 acres, of which 3,760 acres are in Ohio.

The project is operated as a unit of a coordinated reservoir system for flood protection in the Shenango, Beaver, and Ohio River valleys. A master land use plan will guide the ultimate development and use of reservoir land and water areas to achieve maximum practicable water resource values.

Construction of this water resource project was completed in 1967 at an estimated cost, all Federal, of \$36,900,000. Flood damages estimated at \$1,900,000 have been prevented thus far by the project. Recreational visitation at the project in 1969 was 661,000.

WEST BRANCH LAKE Pittsburgh District

West Branch Lake is located on the West Branch Mahoning River in the extreme western part of the Mahoning River Basin and lies entirely within

Portage County, Ohio. The dam is earth—fill, 9,900 feet long, with a maximum height of 83 feet above stream bed.

Stream flow is stored for the combined purposes of flood control and low-flow augmentation. The project has a total storage capacity of 78,700 acre-feet at reservoir—full level. Releases from storage are normally accomplished through a gate-controlled outlet works. For emergency purposes, a side-hill uncontrolled spillway 300 feet long is also provided. Seasonal flood control storage is available, amounting to 33,200 acre-feet in winter and 22,000 acre-feet in summer, to control run-off from a drainage area of 80.5 square miles. Low-flow augmentation storage, amounting to 41,700 acre-feet in winter and 52,900 acre-feet in summer, is provided to increase the minimum average annual flow of the Mahoning River by about 50 cubic feet per second. During normal, flood-free periods the maximum regulated summer pool covers 2,650 acres.

The project is operated as a unit of a comprehensive plan for flood control, contributing materially to the reduction of floods in the Mahoning and Beaver Rivers and supplementing the reductions now afforded on the Ohio River by existing reservoirs. The estimated Federal cost of the project is \$15,740,000 and the non-Federal

cost is \$5,200,000, of which Trumbull County and Mahoning County will contribute \$1,750,000 and \$3,450,000, respectively, in consideration of low-flow augmentation and land enhancement features of the project. The State of Ohio completed a recreation beach in 1970.

The project has prevented flood damages estimated at \$835,000 since its completion in 1966. Recreational visitation at the project for 1969 was 482,000.

WEST FORK OF MILL CREEK LAKE **Louisville District**

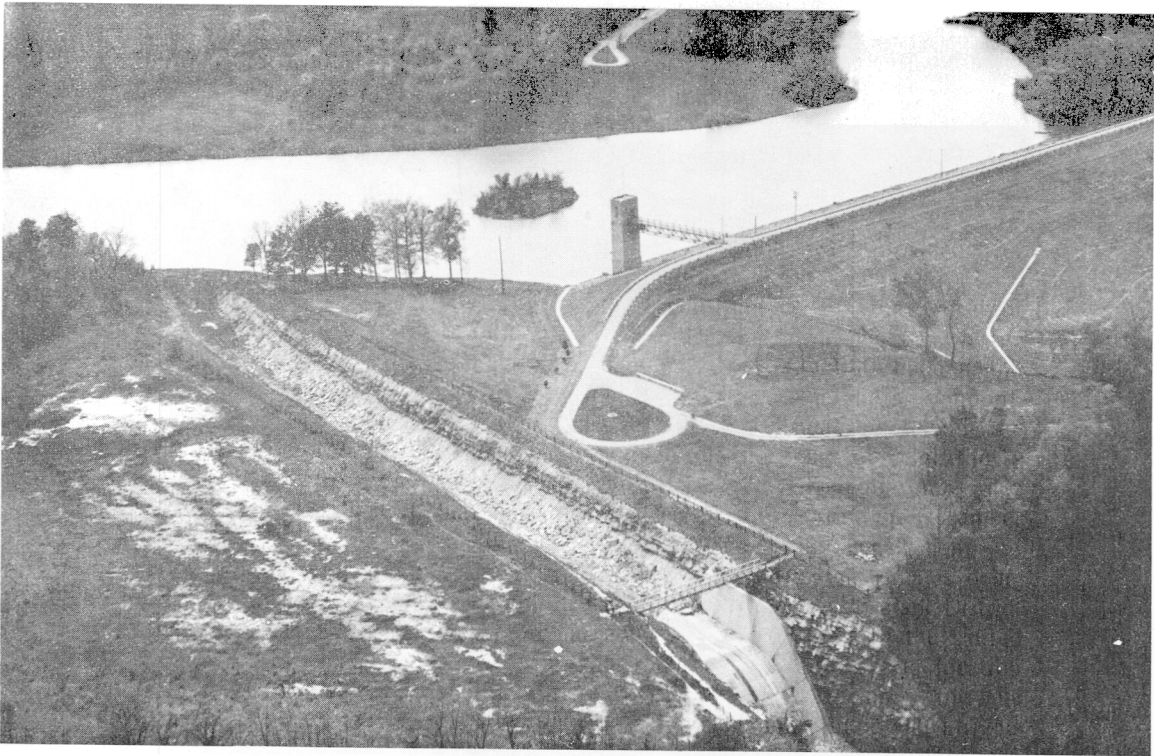
This lake is located in Hamilton County on the West Fork of Mill Creek, a minor tributary of the Ohio River at Cincinnati. The dam, which controls the runoff from a drainage area of 29.5 square miles, is an earth structure 1,100 feet long and 100 feet in maximum height. An uncontrolled channel spillway is located in the right abutment. A permanent pool with an area of 183 acres is maintained at an elevation of 675 feet above mean sea level. Above this pool, to elevation 702, storage capacity of 9,850 acre-feet is available for the temporary storage of flood flows. At full pool, elevation 702, the reservoir has an area of 557 acres. The primary purpose of the project is the storage of flood flows for flood protection in the

West Fork of Mill Creek and the Mill Creek valley below the dam and for the reduction of peak requirements for pumping at the Cincinnati local flood protection project located at the mouth of Mill Creek (described in the section, "Flood Control Projects Completed.")

The permanent pool was provided for purposes of recreation at the request of local interests who contributed to the cost of construction and relocations made necessary by its provision. Project cost is \$3,090,000 Federal and \$571,000 non-Federal. Of the latter amount, \$50,000 was for the permanent pool and the remainder for one-half the cost of relocating a sanitary sewer outside the reservoir area. The project was completed for operation in December 1952. The development and management of recreational facilities in the reservoir area is being accomplished by the Hamilton County Park District in accordance with a license granted by the United States for that purpose. Because of its location within the metropolitan area of Cincinnati, the lake is very popular as a recreation center and attracts more than a million visitors annually. Through 1970, the flood control benefits attributed to operation of this project approximate \$2,420,000, most of which resulted from reductions to flood stages experienced in Mill Creek in January 1959.



WEST BRANCH DAM



**WEST FORK OF MILL CREEK DAM
WITH SPILLWAY IN FOREGROUND**



**WEST FORK OF MILL CREEK LAKE
SHOWING BOAT RENTAL DOCK AND RECREATIONAL FACILITIES**

NAVIGATION PROJECTS UNDER WAY

Work is under way on expansion and improvement of harbor facilities at three Lake Erie ports in Ohio — Cleveland, Lorain and Vermilion. Vermilion is a recreational and commercial harbor with fresh fish being the only commodity handled. Cleveland and Lorain are commercial harbors with long-standing and continuous use. The completed improvements afford access to shipment and receipt of commodities by water over the entire connected Great Lakes waterway system, thus permitting substantial savings in transportation costs to be realized. For the most part, the present program is designed to take advantage of the greater depths now provided in the deepened connecting channels and the St. Lawrence Seaway, thereby resulting in even greater savings. During the period 1965 through 1969, total commerce served by these two ports averaged over 30 million tons annually.

Only those units of the Ohio River Navigation Project which are under way at this time appear in this section. A general description of the Ohio River Navigation Project can be found in the section "Navigation Projects Completed."

CLEVELAND HARBOR **Buffalo District**

Cleveland Harbor is located in Cuyahoga

County on the south shore of Lake Erie at the mouth of Cuyahoga River. Improvements completed by the United States have provided a breakwater—protected outer harbor area five miles long and 1,600 to 2,400 feet wide, a main harbor entrance 700 feet wide between breakwaters, and improved channels in the lower 5.8 miles of Cuyahoga River and the lower mile of the Old River which joins the Cuyahoga a short distance above its mouth. Depths have been provided as follows: 29 feet in the harbor entrance; 28 feet in the west basin and central portion of Cuyahoga River to near its junction with Old River; 25 feet in a 500-foot wide channel through the balance of the east basin and in a separate dock approach channel and 23 feet in the balance of Cuyahoga River and in Old River. Six railroad bridges over Cuyahoga River and a highway bridge over Old River have been replaced as part of the channel improvement work.

Portions of additional improvements authorized in 1958, 1960, and 1966 have not yet been completed. These comprise replacement of a seventh railroad bridge over Cuyahoga River and another over the Old River channel and deepening Old River to 27 feet. Planning is in progress for these uncompleted features.

Total estimated Federal cost of all the above



CLEVELAND HARBOR

is \$38,500,000, of which \$8,270,000 is required to complete the remaining features listed.

Iron ore is the principal receipt and major item of traffic at Cleveland but, on the whole, commerce is quite diversified. There are a large number of terminals, most with rail connections, equipped for trans-shipment of all types of commodities. Average annual traffic in the harbor for the five-year period 1965 through 1969 amounted to 22,930,000 tons. Commerce in 1969 approximated 24,650,000 tons.

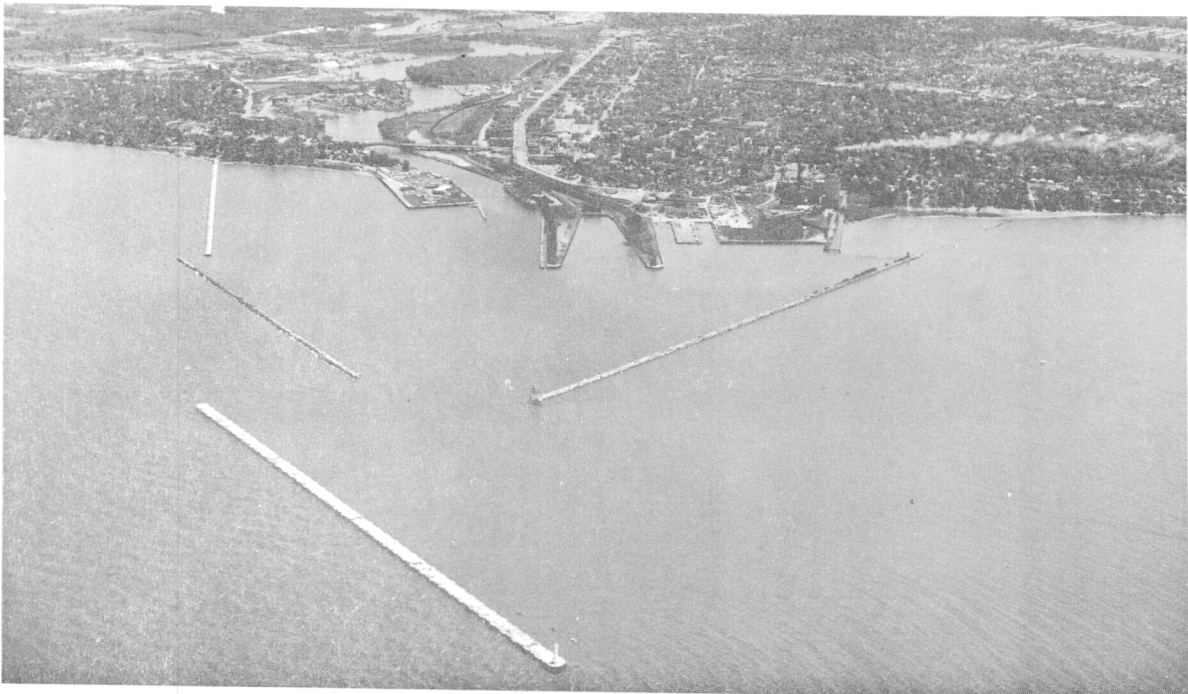
LORAIN HARBOR Buffalo District

Lorain Harbor is situated on the south shore of Lake Erie, in Lorain County, at the mouth of Black River. Improvements by the United States have provided a breakwater system of 10,657 feet aggregate length, forming a protected entrance and outer harbor area, the latter 60 acres in extent, 30 to 25 feet deep; piers at the river mouth; a river channel 27 feet deep in Black River to a point about three miles above the mouth, with two turning basins; and an approach channel 16 feet deep, extending from the main outer harbor area to the municipal pier.

The 1960 River and Harbor Act authorized a major program for additional improvements to the harbor, most features of which have since been completed and incorporated in the project: deepening to the existing project depths, except in a few locations, in 1963; construction of the 2,457-foot shore extension to the east breakwater and removal of 1,100 feet of the east pier, in 1964; construction of the 2,180-foot new detached breakwater off the harbor entrance, in 1965; deepening a triangular area in the outer harbor east of the old east pier, the largest of the remaining undeepened locations, in 1966. The last large upland cut needed to widen the channel at a constrictive bend in the river, designated as Cut No. 1, was started in 1968. Planning for replacement of a railroad bridge over the river channel has been finished, but construction work has not been started.

The total estimated Federal cost for all of the above is \$23,100,000, of which \$9,860,000 is required to complete the project.

The harbor has dry-docks and facilities for building and repairing the largest lake vessels and many terminals with rail connections equipped for trans-shipment of bulk commodities. The city of



**LORAIN HARBOR
THE BREAKWATER SHORE ARM AT THE LEFT AND THE DETACHED BREAKWATER
IN THE FOREGROUND ARE RECENT PROJECT IMPROVEMENTS**

Lorain owns two docks, without rail connections, which are open to public use. Average annual traffic in the harbor for the five-year period from 1965 to 1969 amounted to 7,690,000 tons. The principal receipt and major item of traffic is iron ore. The principal shipment is bituminous coal. The 1969 commerce totaled 9,113,000 tons.

VERMILION HARBOR **Buffalo District**

The project is located in Erie County at the mouth of Vermilion River, which drains to Lake Erie at a point about 37 miles westerly from Cleveland. Two parallel piers, 125 feet apart with an aggregate length of 2,200 feet, extend from the shore at the mouth of the river to a natural depth of 10 feet in the lake. The piers protect a dredged channel 100 feet wide and 12 feet deep. These features of the project were completed in 1878 at a cost of \$133,000.

The 1958 River and Harbor Act authorized modification of the completed project for Vermilion Harbor to include construction of detached arrowhead breakwaters to form a new harbor entrance lakeward of the existing entrance and deepening Vermilion River for a distance of about 2,000 feet above the inner end of the existing entrance channel to 8 feet. Planning for these additional improvements is in progress. Estimated Federal cost for construction is \$1,110,000 (1970 base). Related non-Federal costs are estimated as \$752,000.

Terminal facilities at Vermilion Harbor include fish docks, small-boat docks, and marine railways for small boats. Two docks owned by the village of Vermilion and a boat-club dock are open to the public. The harbor is used extensively as a home port and port-of-call for recreational craft. Fresh fish for commercial markets is the only commodity handled by water at the harbor. The catch was 501 tons in 1969.



VERMILION HARBOR
THE MANY LAGOONS, DEVELOPED BY PRIVATE INTERESTS, ACCOMMODATE
LARGE NUMBERS OF SMALL BOATS AND HAVE ENHANCED THE VALUE
OF THE FEDERAL PROJECT IMPROVEMENTS

OHIO RIVER

Ohio River Division

The Ohio River is a major segment of the extensive Mississippi River System of inland waterways and a valuable component of the transportation facilities of Ohio.

The existing Ohio River navigation project is described under "Navigation Projects Completed." To provide for increasing traffic on the Ohio, construction of replacement projects with larger locks was started in the 1950's. The 46 dams of the older system will be reduced to 19 new structures that will speed up transportation by encouraging larger tows with faster locking on longer pools.

Eight Ohio River replacement projects are now underway. The estimated Federal cost to complete the current replacement program is approximately \$500 million.

The two units of the Ohio River navigation project currently underway that have a direct effect on the southern boundary of Ohio are described below.

HANNIBAL LOCKS AND DAM

Ohio and West Virginia

Pittsburgh District

The Hannibal Locks and Dam project is under construction on the Ohio River at Hannibal, Ohio, approximately one and one-half miles upstream of New Martinsville, West Virginia. The project, when complete, will replace existing obsolete Locks and Dams Nos. 12, 13, and 14 on the Ohio River. The dam will provide a pool, with a navigable depth of 9 feet, extending about 42 miles upstream to the Pike Island Locks and Dam.

The two parallel locks, 110 feet wide and 1,200 and 600 feet long, respectively, are located on the Ohio side of the river. The dam will be a non-navigable, gated structure, 1,098 feet long with a lift of 21 feet between normal lower and upper pools.

Construction of the locks was initiated in 1966 and completed in 1970. Construction of the dam was initiated in 1970 and is scheduled for completion in 1973. The present estimated Federal cost is \$80,000,000.



HEAVY BARGE TRAFFIC ON OHIO



CONSTRUCTION OF LOCKS AT WILLOW ISLAND

WILLOW ISLAND LOCKS AND DAM
Ohio and West Virginia
Huntington District

The Willow Island Locks and Dam are under construction on the Ohio River near Willow Island, West Virginia, and will replace obsolete Locks and Dams Nos. 15, 16 and 17. The dam will provide a pool, with a minimum navigable depth of 9 feet, extending 35 miles upstream to Hannibal Locks and

Dam. The two lock chambers are planned to have the same usable dimensions as other replacement projects, namely, 110 by 1,200 feet for the main lock and 110 by 600 feet for the auxiliary lock. The dam is to be a non-navigable, gated structure with a lift of 20 feet between normal lower and upper pools. The present estimated Federal cost is \$76,100,000. The project is scheduled for completion in 1974.

FLOOD CONTROL PROJECTS UNDER WAY

There are four flood control projects under way in Ohio. One is for the combined purposes of providing flood protection and a harbor for small boats, one is a flood wall and channel improvement, and the others involve channel improvement only. These projects are described below.

ATHENS LOCAL PROTECTION PROJECT Huntington District

The project would be located in Athens County, about 32 miles above the mouth of the Hocking River. Flood damages within the Hocking River floodplain average almost \$800,000 annually. The majority of these damages occur at Athens where annual damages average almost \$500,000. To alleviate this flood problem a channel improvement project is under construction. The plan provides for improving about 26,000 feet of channel by enlarging the bottom width to 215 feet along with channel straightening and realignment. The improved channel will shorten the river by 1,400 feet. Two new highway bridges and a sewage lift station will have to be constructed and adjustment of existing utilities also will be required, all by local interests.

The project is designed to provide protection

for floods equal in magnitude to the second highest of record. The total estimated cost of the project is \$8,210,000, of which \$3,010,000 would be borne by local interests. Construction was initiated in March 1969 and completion is scheduled for March 1971.

EASTLAKE (CHAGRIN RIVER) **LOCAL PROTECTION PROJECT** Buffalo District

The 1965 Flood Control Act authorized a project for improvement of Chagrin River from Lake Erie to a point about 2 miles above the mouth, for the combined purposes of providing flood protection for the city of Eastlake and a harbor for small boat navigation. The project encompasses: arrowhead breakwaters in the lake at the mouth of the river; channel enlargement and a realignment of the river through Eastlake and out to the opening between breakwaters, with a depth of 10 feet from deep water in the lake to a point 1,760 feet above the river mouth, then 7 feet to a point 3,500 feet above the river mouth, and then uniform slopes to natural depths at the upstream project limit; levees where required to supplement channel enlargement; a 1,500-foot long spur channel, 6 feet deep, and a short access channel, 4



ATHENS LOCAL PROTECTION PROJECT
UNDER CONSTRUCTION

feet deep, to a secondary river channel, both for small boats; and a number of appurtenant works.

In case of occurrence of the design flood discharge, the project would prevent an estimated \$200,000 of flood damage to the city. It is expected also that the improvements will prevent formation of sand bars and ice jams at the river mouth which, in the past, have caused considerably greater damages during high flows. The benefits from provision of sure, protected entrance and added berthing area for small boats and, incidentally, for public fishing off the new breakwaters, also are expected to be substantial.

Planning for the project is almost complete and construction is scheduled to begin in 1973. The total estimated net Federal cost is \$3,340,000, of which \$3,140,000 is required to complete the project. The estimated non-Federal cost is \$1,300,000, including an \$856,000 contribution toward Federal construction.

FREMONT LOCAL PROTECTION PROJECT Buffalo District

The project involves improvement of Sandusky River in the city of Fremont, Sandusky County. It provides for enlargement and minor

realignment of the river channel through the city, a distance of about 9,500 feet; levees and floodwalls aggregating 20,600 feet in length; an energy dissipating channel structure near the upper end of the improvement; bank protection; several pumping plants; and numerous modifications to the existing sewer system in the city. Flood damages that would be prevented by the project in case of recurrence of the design discharge, after completion of the improvements, are estimated at \$5,670,000.

Construction of the project was started in July 1970 and is scheduled to be completed by late 1973. Estimated Federal cost is \$8,400,000, and non-Federal cost is \$856,000.

YOUNGSTOWN LOCAL PROTECTION PROJECT Pittsburgh District

The project will provide flood protection for the Crab Creek valley through the city of Youngstown, in Mahoning County, by improvement of the existing creek channel. The plan of improvement will consist of widening, deepening, and paving the channel, with some realignment, for a distance of about 2.2 miles from the mouth upstream, and clearing the existing channel for a short distance farther. The bed of the Mahoning River will be dredged opposite the mouth of the



**FREMONT LOCAL PROTECTION PROJECT
LOOKING DOWNSTREAM ON THE SANDUSKY RIVER THROUGH THE
PROJECT AREA OF FREMONT. CONSTRUCTION ACTIVITY HAS BEEN
INITIATED ON THE PROJECT**

creek to facilitate creek discharge. Appurtenant work will consist of alteration of bridges and adjustment of utilities. Estimated Federal cost is \$3,800,000; non-Federal cost is \$500,000. About one-fourth of the city of Youngstown is in the Crab Creek Basin, and much of the area in the flood plain bordering Crab Creek is occupied by

industrial and commercial plants. The project will eliminate damages in the Crab Creek area from floods up to that of January 1959 intensity, the maximum of record, and will greatly reduce the damages from greater floods. Construction was initiated in 1970 and is scheduled for completion in 1973.

MULTIPLE-PURPOSE PROJECTS UNDER WAY

There are seven multiple-purpose projects currently under way that are entirely in Ohio. Each of these projects includes either recreation or water quality control, or both, as project purposes in conjunction with its flood control purpose.

ALUM CREEK LAKE **Huntington District**

The lake will be located in Delaware County on Alum Creek of Big Walnut Creek, a tributary of the Scioto River. Primary purposes of the project will be flood control and water supply with associated purposes of fish and wildlife conservation, and general recreation. The dam will control runoff from a drainage area of 123 square miles. It will be 90 feet in maximum height, 10,200 feet in total crest length, and will incorporate a gated concrete spillway in the right abutment. A permanent pool with a surface area of 348 acres will be maintained at elevation 841.5 feet above mean sea level. Above the permanent pool up to elevation 888, approximately 79,200 acre-feet of storage will be available for water supply. Above this pool to elevation 901, a maximum storage capacity of 62,800 acre-feet will be reserved for temporary storage of flood flows.

The project will be operated as a unit of a coordinated system for flood protection in Alum Creek, Scioto River, and Ohio River valleys. The estimated Federal cost is \$46,200,000 of which the cost to non-Federal interests for water supply will be \$24,600,000. Pre-construction planning was completed in the spring of 1968 and land acquisition is underway. The contract for the dam, spillway, and outlet works was awarded and construction started in July 1970.

BIG DARBY LAKE **Huntington District**

The lake will be located in the Scioto River Basin, in Franklin and Madison Counties, and will control a drainage area of 448 square miles. The dam will be a compacted earth embankment 3,000 feet long and 100 feet high. The outlet works for normal flow will be a horseshoe tunnel controlled by hydraulically operated sluice gates housed in a gate tower located on the right abutment of the dam. The spillway located in the left abutment of the dam will be controlled by six tainter gates, and the crest of the gravity ogee section will be at elevation 860 feet above mean sea level. One dike will extend northerly from the east end of the

spillway gate structure for about 3600 feet.

A permanent pool at elevation 831 feet above mean sea level with a surface area of 676 acres will be established for sediment deposition and recreation purposes. The flood control storage capacity at maximum pool elevation 888 will be 122,000 acre-feet and will have a surface area of 4,630 acres.

The project will be operated as a unit of a coordinated system of flood protection for the Big Darby Creek, Scioto River basin, and the Ohio River valley. The estimated total cost, all Federal, is \$55,700,000. The average annual benefits for flood control are estimated to be about \$1,050,000. Construction funds have been appropriated and lands at the dam site have been purchased by the Federal Government. Construction is unscheduled at this time.

CAESAR CREEK LAKE **Louisville District**

This project will be located about 30 miles northeast of Cincinnati on Caesar Creek, a tributary of the Little Miami River. Most of the reservoir area is in Warren County, but upstream portions will extend into Clinton and Green Counties. The dam site is about three miles above the mouth of Caesar Creek. At this point the dam will control runoff from a drainage area of 237 square miles. The dam will be an earth and rockfill embankment, 2,650 feet long, with a maximum height of 166 feet and an uncontrolled open cut spillway through the left abutment. The outlet works, which will have two service gates, will be equipped with a low-flow bypass system with multi-level inlets for control of downstream water temperature in the interests of fish and wildlife conservation. Topography of the reservoir area requires construction of four dikes along the northwest drainage divide between Caesar Creek and the Little Miami River.

The project will store water for flood control, water supply, and water quality control, and will provide opportunity for recreation and fish and wildlife activities. Storage below the elevation of 800 feet above mean sea level will be a siltation reserve. For water supply and water quality control, 80,400 acre-feet of storage capacity will be provided between elevations 800 and 846 feet. The remaining capacity of the reservoir, 148,500 acre-feet, will be available for temporary storage of winter-month flood flows. During the spring

months, after the danger of severe floods has passed, the pool level will be raised from elevation 846 to elevation 849 feet to provide a larger area for recreation. Flood control storage capacity during the summer will be 140,000 acre-feet, and the area of the seasonal recreational pool will be 2,830 acres. At reservoir-full level, the total capacity will be 242,000 acre-feet and the resulting pool will cover 6,110 acres.

The project will, upon completion, be operated as a unit of a coordinated system of reservoirs for flood protection in the Little Miami and Ohio River valleys. A master land use plan will guide the development and use of project land and water areas to insure that the maximum possible benefits will be realized. Project plans include developing the full recreational potential of the lake in coordination with local interests.

Construction is scheduled to begin in January 1971 and to be completed in 1974. The cost of the project is currently estimated at \$30,500,000. The State of Ohio has indicated its intention to participate in the project cost to the extent of paying the costs allocated to water supply storage. Federal costs to date are \$4,470,000.

CLARENCE J. BROWN DAM AND RESERVOIR

Louisville District

The reservoir will be in Clark County, two miles northeast of Springfield. The dam will be 7.3 miles above the confluence of Buck Creek and Mad River and will control runoff from a drainage area of 82 square miles. The dam will be an earth-fill structure, 72 feet high and 6,800 feet long, with an open cut spillway through the right abutment ridge. The gate controlled outlet works was completed in May 1968.

Purposes of this project are flood control, recreation and water quality control. The minimum pool will be at elevation 995 with a surface area of 1,010 acres. There will be a conservation pool at elevation 1009 feet above mean sea level with a surface area of 1,940 acres. Between elevations 995 and 1009 feet, the storage capacity is 20,900 acre-feet. This volume will be allocated for water quality control to meet critical low-flow period pollution conditions in the Miami River at and below Dayton. The remaining capacity of the reservoir, 32,900 acre-feet, will be available for temporary storage of winter season flood flows. During the late spring, after the season of severe



CLARENCE J. BROWN DAM AND RESERVOIR
AERIAL VIEW LOOKING DOWNSTREAM AT COMPLETED OUTLET WORKS

floods is past, the reservoir level will be raised to elevation 1012, reducing the flood control capacity to 26,800 acre-feet but increasing the pool surface to 2,120 acres for summer recreation. This higher pool level will also minimize any adverse shoreline effects resulting from releases of water for downstream flow augmentation to meet water quality control requirements. At reservoir-full level, elevation 1023, the total capacity will be 63,700 acre-feet and the surface area will be 2,720 acres.

Clarence J. Brown Dam and Reservoir will reduce to a minimum the flood damages along Buck Creek through Springfield and will effect substantial reductions in damages along Mad River from Springfield to Huffman Dam above Dayton. Regulated releases of the storage provided for water quality control will greatly improve stream conditions on the Miami River at Dayton and other downstream communities. Project plans include developing the full recreational potential of the lake, in coordination with local interests.

The current estimated cost of the project is \$17,800,000, all Federal. Construction started in September 1966 and the project is scheduled to be completed in 1973. Federal costs to date are \$5,540,000.

EAST FORK LAKE **Louisville District**

The lake will be in Clermont County, about 25 miles east of Cincinnati, on the East Fork of the Little Miami River. The dam will be about 21 miles above the junction with the Little Miami River and will control runoff from a drainage area of 342 square miles. The main dam will be a rolled-earth fill, 1,450 feet long, with a height of 200 feet. The spillway will be an uncontrolled open cut through the right abutment ridge. The outlet works will have two service gates and a low-flow bypass system with multiple-level inlets to permit control of downstream water temperature in the interest of fish and wildlife activity. There will also be a second dam to close a saddle in a ridge about one mile north of the main dam. The saddle dam will have a maximum height of 100 feet and will be 2,600 feet long.

The project will be operated for flood control and for storage of water for municipal-industrial water supply, quality control of downstream flows, and recreation. Storage capacity below the elevation of 683 feet above mean sea level will be reserved for siltation. Between elevations 683 and 729, storage capacity of 65,200 acre-feet will be

allocated to water supply and water quality control. During the winter months the remaining capacity of the reservoir, 210,600 acre-feet will be available for temporary storage of flood flows. Late in the spring, after the danger of extreme floods has passed, the reservoir pool level will be raised to elevation 733 to provide a larger water surface for summer recreation and to reduce fluctuations in the pool level because of release or withdrawal of water for other project purposes. The summer flood control capacity will be 202,200 acre-feet, and the surface area of the summer pool at elevation 733 will be 2,160 acres. At reservoir-full level, the total capacity will be 294,800 acre-feet and the water surface area will be 4,600 acres.

The project will operate as a unit of a coordinated system of reservoirs for flood control in the valleys of the Little Miami and Ohio Rivers. The use and development of project land and water areas will be guided by a master land use plan in order that the maximum potential value of the project will be attained. Project plans include developing the full recreational potential of the lake, in coordination with local interests.

Construction started in May 1970 and is scheduled for completion in 1974. The project cost is currently estimated to be \$39,500,000. The state of Ohio has indicated its intentions to share in the cost by paying the costs allocated to the water supply storage function of the reservoir. Federal costs to date are \$4,700,000.

NORTH BRANCH OF KOKOSING LAKE **Huntington District**

The lake will be formed on the North Branch of Kokosing River in Knox County by construction of an earth-fill dam located about two miles northwest of Fredericktown. The dam will be 69.5 feet high with a total crest length of 1400 feet and will control a drainage area of 44.5 square miles. An uncontrolled overflow type spillway will be located adjacent to the right abutment. A minimum pool at elevation 1121 feet above mean sea level with a surface area of 154 acres, will be established for sediment deposition and recreation purposes. The flood control storage at maximum pool elevation 1146 will be 13,842 acre-feet and will have a surface area of 1140 acres.

The project will afford flood protection in the North Branch and lower Kokosing River valleys, and flood control benefits to Mt. Vernon, Ohio, will be augmented by the Mt. Vernon Local Protection Project (see section on "Flood Control Projects Completed"). The estimated total cost, all Federal,

is \$6,800,000. The average annual benefits for flood control are estimated to be about \$249,000. Funds to initiate construction were appropriated in the fall of 1966. The project is scheduled for completion in 1973.

PAINT CREEK LAKE **Huntington District**

The lake will be located in the Scioto River Basin, in Ross and Highland Counties, on Paint Creek 37 miles above the mouth. An earth-rock embankment dam will control a 573 square mile drainage area. It will have a maximum height of 118 feet and a total crest length of 700 feet and will have a gated concrete gravity spillway section incorporated in the earth fill structure. A permanent pool with a surface area of 710 acres will be maintained at elevation 786 feet above mean sea

level. A water supply pool will be provided between elevations 786 and 787.5 containing 1040 acre-feet of storage with a surface area of 770 acres at elevation 787.5. A seasonal (water quality control) pool will be established at elevation 798 for recreation development and low flow augmentation and will have a surface area of 1,190 acres. Flood control storage capacity of maximum pool elevation 845 will vary from 124,800 acre-feet in the summer to 135,000 acre-feet in the winter.

The project will be operated as a unit of a coordinated system for flood protection in the Paint Creek and Scioto and Ohio River valleys. The estimated project cost is \$24,700,000 of which \$242,600 would be the cost to local interest for water supply. Construction was started in June 1966 and is scheduled to be completed in June 1973.

AUTHORIZED NAVIGATION PROJECTS

The program of navigation improvements in Ohio includes seven projects that have not been constructed. All but two are modifications of previously completed projects. The West Harbor project would improve an existing natural lagoon. Those improvements in the category of Active Authorized Navigation Projects not yet constructed will require preconstruction planning to develop current estimates of cost and feasibility as well as to develop final construction plans when selected for construction. There are three projects in this

category. Based on previous studies and present knowledge, those in the categories of Deferred and Inactive Authorized Projects will require initial preliminary studies as a basis for determining whether current feasibility and the views of local interests are such as to warrant further detailed pre-construction planning. In view of this prerequisite study, estimates of cost for the projects in the latter two categories have not been advanced from the dates indicated to reflect increases caused by rising price levels since those times.

ACTIVE AUTHORIZED NAVIGATION PROJECTS

CONNEAUT HARBOR

Buffalo District

The 1966 River and Harbor Act authorized modification of the completed project for Conneaut Harbor as follows: construction of facilities needed to create a protected small-boat harbor in the southwest corner of the existing harbor, consisting of a stone dike, 2,200 feet in length, extending easterly from the west breakwater for about 300 feet, then turning southerly parallel to the city dock channel; an east-west channel, 1,200 feet long, 100 feet wide and 6 feet deep, from the city dock channel into the new small-boat area; an inner north-south channel, 1,600 feet long, 100 feet wide and 6 feet deep; closure of the gap in the west breakwater; and a guard rail on a section of the west breakwater. Total estimated cost for these additional improvements is \$1,430,000 (1970 base), half Federal and half non-Federal.

HURON HARBOR

Buffalo District

The 1962 River and Harbor Act authorized modification of the completed project for Huron Harbor as follows: construction of a detached breakwater lakeward of the existing harbor entrance; realignment of the existing lake approach channel and deepening of the channel to 29 feet from deep water to the outer end of the east

breakwater and then to 28 feet in the remainder of the existing channel; deepening and subsequent maintenance, to 27 feet, of a channel in the lower river; and enlargement, deepening and subsequent maintenance of the turning basin. Total estimated Federal cost for these additional improvements is \$13,900,000 (1970 base). Estimated non-Federal costs for related improvements is \$1,820,000.

WEST HARBOR

Detroit District

This small-craft harbor occupies a natural lagoon on the eastern shore of the Marblehead Peninsula, 13 miles northeast of Port Clinton. The harbor has all the natural elements to make it a good recreational harbor in this popular island area of Lake Erie.

The 1965 River and Harbor Act authorized Federal improvement by construction of a breakwater-protected entrance from Lake Erie into the natural outlet of West Harbor, with access channels leading to the berthing areas.

The estimated cost to the United States for construction is \$715,000, with a like amount to be contributed by local interests. Construction of the authorized improvements is contingent upon receipt of funds and required local cooperation.

DEFERRED AUTHORIZED NAVIGATION PROJECTS

ASHTABULA HARBOR Buffalo District

A project was authorized in 1937 for removal of 250 feet of inner breakwater of the existing project at a Federal cost estimated in 1954 to be \$128,000.

ASHTABULA HARBOR Buffalo District

In conjunction with the above project, additional work was authorized in 1960 consisting of deepening a triangular area at the site of the portion of inner breakwater to be removed. The Federal cost was estimated in 1961 to be \$427,000.

INACTIVE AUTHORIZED NAVIGATION PROJECTS

FAIRPORT HARBOR Buffalo District

Estimated federal cost is \$3,170,000 (1953 base).

LAKE ERIE—OHIO RIVER CANAL Pa. and Ohio Pittsburgh District

The House Committee on Appropriations directed the termination of all the planning work incidental to the navigation elements of the project, but approved continued planning of the Grand River Lake in Ohio solely for the purposes of flood control, water supply, water quality control, recreation and fish and wildlife. See Grand River Lake under "Surveys Underway."

AUTHORIZED FLOOD CONTROL PROJECTS

The water resources development program of the Corps of Engineers in Ohio includes a number of authorized flood control projects which have not been constructed. This portion of the program includes 51 local protection projects and five reservoirs. Most of the projects along the Ohio River and its tributaries are units in a comprehensive plan for flood control and other purposes in the Ohio River Basin.

Authorized projects are described in this section under three headings: Active Authorized, Deferred Authorized, and Inactive Authorized. All Active Authorized Projects not yet constructed will require preconstruction planning to develop current

estimates of cost and feasibility as well as to develop final construction plans when selected for construction. Four projects are included in this category. Based on previous studies and present knowledge, those in the categories Deferred and Inactive Authorized Projects will require initial preliminary studies as a basis for determining whether current feasibility and the views of local interests are such as to warrant further detailed preconstruction planning. In view of this prerequisite study, estimates for projects in the latter categories are generally on a 1954 base and have not been advanced to reflect increases caused by rising price levels since that time. Fifty-two projects are included in these latter categories.

ACTIVE AUTHORIZED FLOOD CONTROL PROJECTS

CHILLICOTHE LOCAL PROTECTION PROJECT Huntington District

The project would provide partial protection for Chillicothe against the floodwaters of the Scioto River. It would consist of 0.4 mile of concrete wall and 1.2 miles of earth levee tied into a recently completed highway fill, with three pumping stations for the disposal of sewage and drainage from the protected area during floods. Five gate openings would be provided in the line of protection to permit passage of traffic during non-flood periods. These would be closed by gate structures during floods. The project would provide protection from a flood 1.8 feet higher than the flood of record with a three-foot freeboard; however, the portion of the city south of Fifth Street would be subject to backwater flooding by way of Paint Creek.

The Chillicothe local protection project is designed to be supplemented by the authorized system of reservoirs on Scioto River tributaries above the project. The total estimated cost of the project is \$5,500,000, of which \$1,380,000 would be borne by local interests.

EMPIRE--STRATTON LOCAL PROTECTION PROJECT Pittsburgh District

The project would provide for protection of Empire and Stratton from flooding of the Ohio River. The project would consist of structures for internal drainage with the reconstructed highways acting as dikes.

The estimated Federal and non-Federal costs are \$470,000 and \$13,000, respectively.

OTTAWA LOCAL PROTECTION PROJECT Detroit District

The project would be located on the Blanchard River at Ottawa in Putnam County. It would consist of a system of earth levees and concrete floodwalls along the north bank of the Blanchard River for its entire course through the village of Ottawa from the fairgrounds to the sewage disposal plant. Earth levees would also be constructed on the south bank of the Blanchard River from Williamstown Road to Meyer Street. The project would include channel modifications and minor channel improvements, alterations, additions and modifications to highway and railway bridges and utilities, and associated interior drainage facilities. The improvements would control floods up to the magnitude of the March 1913 record flood of 29,000 cfs, and would prevent about 90 percent of the estimated average annual damages at Ottawa.

The estimated cost of the project is \$4,670,000 (July 1967 base) of which \$4,100,000 would be the cost to the United States and \$570,000 to local interests. The \$570,000 includes a reimbursable amount of \$80,000 to be paid by local interests prior to construction. Maintenance and operation of the project would be the responsibility of local interests.

RENO BEACH -- HOWARD FARMS AREA LOCAL PROTECTION PROJECT Detroit District

The project site is located in Lucas County, between Cooley Creek and Wards Canal, on the

shore of Lake Erie 15 miles east of Toledo. The area to be protected consists of more than three square miles and has a lake frontage of 15,400 feet. The authorized protection works include about 8,000 feet of roadway seawall, consisting of an earth dike faced on the lake side with quarry-run stone fill and a minor floodwall connecting existing seawalls in the vicinity.

The project would: (1) protect the area from flood damages resulting from windstorms and high stages of water on Lake Erie, (2) enhance land values, (3) add materially to recreational facilities, and (4) increase the security of the residents.

DEFERRED AUTHORIZED FLOOD CONTROL PROJECTS

ADENA LOCAL PROTECTION PROJECT Pittsburgh District

The project would be located at Adena in Jefferson County. It would consist principally of deepening, widening, and protecting the channels of Short Creek, a direct tributary to the Ohio River, and South Fork for a total distance of about 5,500 feet. A limited amount of levee along one bank and drainage ditches also would be provided.

The project would afford protection for the flooded areas of Adena against a discharge about 30 percent greater than the peak discharge of the flood of March 1913, the maximum of record.

The estimated cost of the project is \$350,000 (July 1960 base), of which \$283,000 would be the cost to the United States and \$67,000 to local interests. Maintenance of the project would be the responsibility of local interests.

BELLAIRE LOCAL PROTECTION PROJECT Pittsburgh District

The project would be located along the Ohio River in Belmont County and would provide protection for Bellaire against a flood equal to the maximum of record which occurred in March 1936. The project would consist of earth levees, concrete walls, traffic openings and internal drainage facilities. Based on 1954 price level the project cost is estimated to be \$7,660,000 Federal and \$1,870,000 non-Federal.

A restudy of this project is currently under way to determine the engineering and economic feasibility of providing for protection for Bellaire

The estimated cost of the project is \$1,300,000 (July 1968 base), of which \$975,000 would be Federal funds. In addition to providing the remainder of the first cost of the protection work, local interests would be responsible for maintenance of the project. No planning or construction funds have been allotted.

Some emergency repairs were made to breaches in the existing dikes in 1952, 1953, and 1966 under the authority provided to the Chief of Engineers in Section 212 of the Flood Control Act of 1950. These emergency repairs to the existing dikes cost about \$53,200.

with present costs and conditions of development.

BELPRE LOCAL PROTECTION PROJECT Huntington District

In the upper reaches of the Ohio River, the March 1913 flood is the maximum of record. The levee and floodwall system contemplated at Belpre, in Washington County, would be capable of withstanding such a flood. Drainage facilities and traffic openings would be among the project appurtenances required. The coordinated upstream reservoir program would provide supplementary flood protection.

The estimated Federal and local costs for the Belpre project (1954 base) are \$3,570,000 and \$448,000, respectively. The works would be maintained and operated at local expense.

BUENA VISTA LOCAL PROTECTION PROJECT Huntington District

Protection for Buena Vista, Scioto County, against a flood on the Ohio River equivalent to that of January 1937, the highest flood of record at this locality, would be provided by this project. The works contemplated would consist of a system of earth levees estimated to cost \$790,000 (1954 base) of which \$197,000 would be the local share. Arrangements would be made for the disposal of sewage and drainage from the protected area during floods, and gated traffic openings, to be closed during floods, would be provided for unrestricted traffic movement during flood-free periods. These works would be supplemented by the coordinated upstream reservoir system. The project would be maintained and operated by local interests.

CHESHIRE LOCAL PROTECTION PROJECT **Huntington District**

This project would be located on the Ohio River at Cheshire, in Gallia County. It would consist of a system of earth levees and of appropriate facilities for the disposal of sewage and drainage from the protected area during floods. Openings would be provided in the line of protection to permit passage of traffic during non-flood periods. These would be closed by gate structures during floods. The project would afford protection against a flood equal in magnitude to that of March 1913, the maximum of record. It would be supplemented by the coordinated system of reservoirs on upstream Ohio River tributaries.

The latest available estimated total project cost (1954 base) is \$566,000, of which the local share is \$147,000. Operation and maintenance of the project would be the responsibility of local interests.

COAL GROVE LOCAL PROTECTION PROJECT **Huntington District**

A wall and levee system with necessary appurtenant traffic openings and drainage facilities is contemplated at Coal Grove, on the Ohio River, in Lawrence County. The project, acting alone, would withstand a flood equivalent to the maximum of record, that of January 1937. Supplemental protection would be provided by the coordinated system of reservoirs on Ohio River tributaries above the project.

The estimated total cost of the Coal Grove improvement (1954 base) is \$943,000, of which about \$55,000 would be the local share. Operation and maintenance of the project would be local responsibilities.

DILLONVALE LOCAL PROTECTION PROJECT **Pittsburgh District**

The project would be located at Dillonvale in Jefferson County, on Short Creek, a direct tributary to the Ohio River. It would consist principally of deepening, widening, and protecting the channel of Short Creek through Dillonvale for a distance of about 11,000 feet. The project would afford protection for the flooded areas of Dillonvale against a discharge equal to the maximum of record experienced in March 1913.

The estimated cost of the project is \$446,000 (as of July 1960), of which \$388,000 would be

Federal and \$58,000 would be the local share. Project maintenance would be a local responsibility.

FRAZEYSBURG LAKE **Huntington District**

The lake would be located in Muskingum, Licking, and Coshocton Counties in the Muskingum River Basin, on Wakatomika Creek, and would control the runoff from a drainage area of 139 square miles. The dam would be of earth construction, 72 feet in maximum height, 710 feet in length, and would have an uncontrolled spillway in the left abutment. A minimum pool would be maintained at elevation 781.5 feet above mean sea level with an area of 970 acres. Above this pool, to elevation 805.5, a storage capacity of 52,000 acre-feet would be provided for the temporary storage of flood flows. At full pool, elevation 805.5, the reservoir would have an area of 3,440 acres.

The project would be operated as a unit of a coordinated reservoir system for flood protection in the Wakatomika Creek, Muskingum, and Ohio River valleys. To the extent consistent with the primary purpose of the project, the reservoir area would be developed for recreation activities and beneficial uses of lands, forests, and fish and wildlife resources.

The estimated cost of Frazeyburg Lake (1960 base) is \$7,200,000, all of which would be borne by the United States.

GALLIPOLIS LOCAL PROTECTION PROJECT **Huntington District**

The project would be located on the Ohio River at Gallipolis, in Gallia County. It would comprise a system of concrete walls and earth levees, with appropriate facilities for the disposal of sewage and drainage from the protected area during floods. Openings would be provided in the line of protection to permit passage of traffic during non-flood periods. These would be closed by gate structures during floods. The project would afford protection against a flood equal in magnitude to that of January 1937, the maximum of record at this location, and would be supplemented by the coordinated system of reservoirs on Ohio River tributaries above the project.

The latest estimate of project cost made in 1954 was \$3,509,000, of which the local share would be \$839,000. Operation and maintenance of the project would also be responsibilities of local interests.

LOGAN LAKE
Huntington District

The lake would be located in the Hocking River Basin, in Fairfield and Hocking Counties, on Clear Creek, near Lancaster. The dam would control the runoff from a drainage area of 84 square miles and would be of earth-fill construction, with a maximum height of 114 feet. An uncontrolled spillway cut would be located in the left abutment. A minimum pool would be maintained at elevation 813 feet above mean sea level with an area of 312 acres. Above this pool, to elevation 854, a storage capacity of 37,100 acre-feet would be available for water quality control and water supply. Additionally the pool at elevation 854 would be the recreational pool with an area of 1,825 acres. The remaining capacity of the reservoir, 35,900 acre-feet to elevation 868, would be provided for the temporary storage of flood flows. At full pool elevation, the reservoir would have an area of 3,100 acres. The estimated cost of the project is \$44,100,000 of which \$13,200,000 would be non-Federal.

The project would be operated as a unit of a coordinated reservoir system for flood protection in the Hocking River and Ohio River valleys. The reservoir area would be developed for recreational activities and beneficial uses of lands, forests, and fish and wildlife resources. Water supply, water quality control and economic expansion would be additional project purposes. Preservation and enhancement of a natural area also is proposed which would include the lands downstream from the dam to the mouth of Clear Creek.

The study results are included in the Report for Development of Water Resources in Appalachia.

MOSCOW LOCAL PROTECTION PROJECT
Louisville District

At Moscow, in Clermont County, the maximum flood stage of record is that of January 1937. A levee system is contemplated of sufficient height to withstand such a flood stage. Supplemental flood protection would be provided by the coordinated reservoir system on Ohio River tributaries above the Moscow area. The estimated cost of the levee system is \$1,540,000 (1954 base), of which \$1,170,000 would be borne by the United States and \$372,000 by local interests, who would also be required to maintain and operate the works upon completion.

POMEROY LOCAL PROTECTION PROJECT
Huntington District

The maximum flood of record at Pomeroy, in Meigs County, is that of 1913. A system of concrete walls and earth levees of sufficient height to withhold a flood equivalent in stage to the maximum of record is contemplated at that locality. When the last cost estimate revision for this project was made in 1954, it was estimated that the project would cost about \$16,800,000, of which the local share would be about \$346,000. Local interests would be required to maintain and operate the project.

Partial flood protection is provided at Pomeroy through reductions in Ohio River stages by the reservoirs already completed at upstream locations.

PROCTORVILLE LOCAL PROTECTION PROJECT
Huntington District

This project for local flood protection would provide for the removal of Proctorville, in Lawrence County, from its present flood plain location and its resettlement in an area above the limits of the January 1937 flood, the maximum of record in the Proctorville area.

On a 1954 basis, the estimated total project cost is \$2,700,000. Some measure of flood protection is now afforded here as at other localities on the Ohio River, by reason of the reductions in flood stages effected by completed reservoirs at upstream locations.

RACINE LOCAL PROTECTION PROJECT
Huntington District

To be located on the Ohio River at Racine, in Meigs County, the project would consist of a system of walls, levees and necessary appurtenant facilities designed to withhold a flood equivalent in stage to that of March 1913, the maximum of record in this reach of the Ohio River. Reservoirs in the Ohio River basin program above Racine provide supplemental flood protection.

When last revised in 1954, the estimated project cost was \$1,110,000 including \$120,000 as the estimated local share. Operation and maintenance of the project would be at local expense.

SYRACUSE LOCAL PROTECTION PROJECT Huntington District

The project would be located on the Ohio River at Syracuse, in Meigs County. It would consist of a system of concrete walls and earth levees, with appropriate facilities for the disposal of sewage and drainage from the protected area during floods. Openings would be provided in the line of protection to permit passage of traffic during non-flood periods. These would be closed by gate structures during floods. The project would afford

protection for Syracuse against a flood equal in magnitude to that of March 1913, the maximum of record at this location and would be supplemented by the coordinated system of reservoirs on Ohio River tributaries above the project.

On a 1954 price basis, the latest revision available, the estimated project cost is \$1,320,000, including a local cost of \$100,000. Operation and maintenance of the project would be local responsibilities.

INACTIVE AUTHORIZED FLOOD CONTROL PROJECTS

Local Protection Projects	Estimated Federal Cost (All 1954 base)
Aberdeen	\$ 1,430,000
Athalia	630,000
Brilliant	3,240,000
Burlington	146,000
Chambersburg	1,600,000
Chesapeake	330,000
Chilo	899,000
Cincinnati, (California Section)	1,750,000
Cincinnati, Unit 2	16,800,000
Cincinnati, Unit 4	14,900,000
Clarrington	2,710,000
Cleves	1,240,000
Columbus	475,000
Hanging Rock	467,000
Higginsport	944,000
Hockingport	568,000
Letart Falls	992,000
Manchester	1,330,000
Mapleshade	1,330,000
Marietta	14,000,000
Martins Ferry	8,630,000
Middleport	6,260,000
Miller	519,000
Mingo Junction	1,920,000
New Matamoras	2,090,000
Newport	318,000
New Richmond	3,200,000
Portland	1,040,000
Powhatan Point	4,710,000
Ripley	1,940,000
Sardis	285,000
Sciotoville	1,460,000
South Point	992,000
Zanesville	8,110,000
Lakes	
Eagle Creek	12,700,000
Millersburg	12,000,000
Rocky Fork	4,410,000

AUTHORIZED MULTIPLE-PURPOSE PROJECTS

There are three authorized multiple-purpose projects in Ohio on which construction has not been started. All are reservoir projects and would serve specific purposes in addition to that of flood control. They are classified as Active Authorized

Multiple-Purpose Projects. Detailed preconstruction planning to develop current estimates of cost and feasibility as well as to develop final construction plans is either completed or underway for each project.

ACTIVE AUTHORIZED MULTIPLE-PURPOSE PROJECTS

MILL CREEK LAKE Huntington District

The Mill Creek Lake will be located in the Scioto River Basin, in Delaware County. Primary purposes are flood control and water quality control. These will be supplemented by fish and wildlife conservation and general recreation. The basic structure would be an earth fill dam 1.5 miles above the mouth of Mill Creek. The dam would control a drainage area of 181 square miles and would have a maximum height of 89 feet and total crest length of 12,000 feet. The dam structure would incorporate a gated concrete gravity spillway section. The total storage capacity of the reservoir would be 92,500 acre-feet of which 4,000 acre-feet would be in the minimum pool. Above this, 26,000 acre-feet would be available for seasonal water quality control. The remainder would be reserved for flood control purposes.

The project would be operated as a unit of a coordinated system for flood protection in the Mill Creek, Scioto River, and Ohio River valleys. The total estimated cost of the project is \$30,300,000, all Federal. Preconstruction planning is under way and is scheduled to be completed in February 1972. A construction schedule has not been established at this time.

SALT CREEK LAKE Huntington District

The Salt Creek Lake will be located in the Scioto River Basin in Ross and Vinton Counties. The principal structure will be an earth fill dam, 15.0 miles above the mouth of Salt Creek, which will control a 285 square mile drainage area. The dam, having a maximum height of 96 feet and a total crest length of 1,490 feet, will be protected against overtopping by an uncontrolled spillway located in a saddle near the left abutment. A minimum pool, having a surface area of 924 acres, will be maintained at elevation 620 feet above mean sea level. A seasonal pool with a surface area of 1,250 acres will be established at elevation 624 for fish and wildlife and general recreation. Flood

control storage capacity at maximum pool elevation 659 will vary from 93,665 acre-feet in the summer to 98,000 acre-feet in the winter.

The project will be operated as a unit of a coordinated system for flood protection in the Salt Creek, Scioto River and Ohio River valleys. The total estimated cost of the project is \$22,600,000, all Federal. Preconstruction planning is 89% complete.

UTICA LAKE Huntington District

The Utica Lake was authorized by the Flood Control Act of 1968. The project will provide water supply and water quality control for the Licking Basin, will reduce flood crests along the North Fork, and will be operated for recreation and for fish and wildlife preservation and enhancement purposes.

The project would be located in Knox County on North Fork of Licking River, formed by a rolled earth-fill dam controlling a drainage area of 113.8 square miles. The dam will be 73 feet in maximum height and 4,880 feet in total crest length. An uncontrolled spillway would be located in the right abutment. A permanent pool with a surface area of 1,040 acres will be maintained at elevation 970 feet above mean sea level. Above the permanent pool and up to elevation 982.5, approximately 23,200 acre-feet of storage will be available for water supply. A winter pool at elevation 989.8 having a surface area of 4,023 acres would be provided for water quality control. Flood control storage capacity at elevation 996.3 feet above mean sea level would vary from 23,000 acre-feet during the summer recreational season to 28,000 acre-feet during the winter-spring season. The estimated total cost (June 1970) is \$39,400,000, of which \$12,400,00 is non-Federal. Completion of Plans and Specifications for first construction work, Relocation of the Railroad and State Route 13, are now scheduled for completion in FY 1974.

AUTHORIZED SHORE PROTECTION PROJECTS

There are five authorized shore protection projects in the State of Ohio, all of them on Lake Erie frontage. Shore protection projects are cooperative ventures in which Federal participation may be from 50 to 70 percent of the cost of protecting and improving publicly-owned shores. The three projects classified as Active Authorized Shore Protection Projects would require

preconstruction planning to develop current estimates of cost and feasibility as well as to develop final construction plans. The two projects in the category of Deferred Shore Protection Projects would require additional preliminary studies to determine current feasibility and views of local interests before detailed preconstruction planning could be initiated.

ACTIVE AUTHORIZED SHORE PROTECTION PROJECTS

CRANE CREEK STATE PARK

Detroit District

The project would be located in Lucas and Ottawa Counties, on the shore of Lake Erie, about 25 miles east of Toledo, Ohio. It would include restoration and protection of the shore by construction of a sand barrier beach along 17,800 feet of shore. Thirty-six groins spaced generally at 500-foot intervals and extending about 300 feet lakeward would be constructed to trap littoral drift and reduce future erosion.

The estimated total first cost and the Federal share of the project would be \$3,300,000 and \$2,310,000 respectively. The project was authorized by the Flood Control Act of 1962. No planning or construction funds have been allotted.

SHEFFIELD LAKE COMMUNITY PARK

Buffalo District

This project authorized by the 1962 River and Harbor Act, would be located on Lake Erie frontage in Lorain County, Ohio, owned by the city of Sheffield Lake. It would consist of the

construction of two groins and placement of sand beach fill between them. The relocation of an existing storm sewer is a related project feature to be accomplished entirely at local expense. The total estimated cost of the project, exclusive of the sewer relocation is \$498,000, of which a 60 percent share to be contributed by the Federal Government amounts to about \$299,000.

LAKEVIEW PARK

Buffalo District

This project was authorized by the 1954 River and Harbor Act. At the request of the city of Lorain, the project was restored to the Active category in 1969. The project would provide for the improvement of the 1,600-foot frontage of a city park located just westerly of Lorain Harbor by the modification of four existing groins and placement of sand fill. The project cost estimate updated to present price levels is about \$1,260,000 of which the Federal 70 percent share would be \$882,000 and the non-Federal contribution would be \$378,000. Preconstruction planning will be initiated as soon as funds are available.

DEFERRED AUTHORIZED SHORE PROTECTION PROJECTS

The two projects in this category were authorized by the 1954 River and Harbor Act. The Federal share of the cost was authorized to be one-third of the total. Reevaluation of cost participation based on Public Law 87-874, enacted in 1962, which countenances Federal cost sharing up to 70 percent of the total, has not been made pending restudy of the projects.

EDGEWATER PARK

Buffalo District

The project would comprise protection of this city of Cleveland waterfront park with sand fill, 5

new groins and modification of 4 existing groins, at a cost estimated in 1959 to total \$4,881,000, of which \$1,627,000 was the Federal share.

WHITE CITY PARK

Buffalo District

Protection of the Lake Erie frontage of this city of Cleveland park would include construction of a cutoff wall and groin and redistribution of existing sand. The Federal share was estimated in 1955 to amount to \$73,000 and the non-Federal contribution to be \$146,000.

WORK UNDER SPECIAL CONTINUING AUTHORITIES

SMALL NAVIGATION PROJECTS

Section 107 of the 1960 River and Harbor Act provides authority for the Chief of Engineers to develop and construct small navigation projects within cost limitations prescribed by the law, provided each project is complete within itself and economically justified. Projects under this authority in Ohio are described below.

CINCINNATI HARBOR **Louisville District**

The investigations were initiated at the request of the Department of Urban Development of the city of Cincinnati and the Ohio Department of Natural Resources. As a part of the Central Riverfront Urban Renewal Project undertaken by the city of Cincinnati, it is proposed to develop a marina and small-boat harbor along the river bank between the L&N Railroad bridge and the Central bridge. Measures under consideration include an excavated harbor, a paved launching ramp, some type of protection to the harbor from wave wash and other appurtenant structures. Consideration will first be given to the development of protected launching facilities in lieu of a harbor embayment. If this is found infeasible, a harbor will be studied. The city of Cincinnati has furnished maps, bank sections and boring logs of the area. The city has acquired all but one tract of the properties needed for the project. Field reconnaissance and contacts with officials of the city of Cincinnati have been made.

CLEVELAND HARBOR **Buffalo District**

Under this authority, a modification to the Cleveland Harbor project (see "Navigation Projects Under Way"), increasing the project depth in the upper end of the Old River channel from 21 to 27 feet, was authorized in December 1966. Part of the deepening, to 23 feet, was accomplished in 1968.

EAST HARBOR **Detroit District**

A detailed project report has been substantially completed for improvement of East Harbor in the interest of recreational navigation. East Harbor is located in the "Islands Area" of southwestern Lake Erie, which includes the Bass Islands, Kelleys Island, and the Marblehead Peninsula. It occupies the most easterly of three

prominent lagoons located along the Lake Erie side of the Marblehead Peninsula. West Harbor occupies the most westerly of these lagoons. The harbor is located in Ottawa County, about eight miles east of Port Clinton and about eight miles northwest of Sandusky. The work would consist of an extension of the existing west breakwater, a new detached breakwater, an improved entrance channel between the breakwaters, and an access channel and anchorage area within the harbor lagoon. The State of Ohio has indicated a willingness to furnish the necessary local cooperation.

KELLEYS ISLAND HARBOR **Detroit District**

Located on the north shore of Kelleys Island in western Lake Erie between Marblehead, Ohio, and Pelee Island, Ontario, about 12 miles north of Sandusky Harbor, Ohio. The project provides for two breakwaters having an aggregate length of about 1,100 feet with recreational fishing facilities provided thereon; a flared approach channel 12 feet deep, decreasing in width to 100 feet between the breakwaters; an entrance channel 10 feet deep and varying in width from 300 feet, at a point about 200 feet offshore, to 150 feet at the shoreline; and an access and maneuvering area of about 4.3 acres, 8 to 10 feet deep. Preconstruction planning has been initiated.

The estimated Federal cost for new work is \$500,000, excluding \$522,000 to be contributed by local interests. Estimated total cost to local interests is \$2,320,000, which includes docking and berthing facilities and harbor headquarters. A state park is scheduled to be developed by the State of Ohio in conjunction with the harbor.

LORAIN HARBOR **Buffalo District**

A detailed project report is being prepared, relative to modification of the existing navigation project to include provision of a protected small-boat basin in the east outer harbor. The report is scheduled for completion in 1971.

PORTSMOUTH STATE PARK MARINA **Huntington District**

A detailed project report is being prepared for the construction of a small boat harbor and marina at the proposed Portsmouth State Park located

along the Ohio River about 7 miles downstream from Portsmouth, Ohio. The proposed harbor has an area of about 12 acres and would provide berthing facilities for approximately 240 recreational boats. The Federal project would consist of an entrance channel, access channels within the harbor and a retaining wall along the Ohio River. Local interest would provide docking and berthing facilities and other on-shore facilities. A state park is being developed by the State of Ohio in conjunction with the boat harbor and Marina. The report is scheduled for completion in FY 71.

TOLEDO HARBOR **Detroit District**

A detailed project report is being prepared to determine the need for a deep-draft anchorage basin on the south side of the Maumee River channel near its mouth. Completion of the report is dependent on the development of sufficient economic justification, cost determinations, and the provision of assurances of local cooperation.

SMALL FLOOD CONTROL PROJECTS

Section 205 of the Flood Control Act of 1948, as amended, provides authority for the Chief of Engineers to develop and construct small flood control projects, within cost limitations prescribed by the law, provided each project is complete within itself and economically justified. Completed and active projects under this authority in Ohio are described below.

AMSTERDAM **Pittsburgh District**

The project is located at and in the vicinity of Amsterdam in the headwater reach of Yellow Creek, in Jefferson County, Ohio. It consists of 4,100 feet of channel enlargement and deepening with some realignment. The upper 585 feet, which extends through and under the business area of the Main Street and Liberty Street bridges, is paved. As a major feature of local cooperation, the Main Street bridge was reconstructed to conform to the improved channel width, alignment, and vertical clearance requirements. The project affords protection against a flood equal to that of August 1952. It was completed in 1958, at a Federal cost of about \$183,000. The village of Amsterdam was the principal cooperating agency, with assistance from Jefferson County and with the cooperation of the State of Ohio Department of Highways. Flood control benefits realized to date amount to \$44,000.

BIG CREEK AT CLEVELAND **Buffalo District**

A reconnaissance report is being prepared to determine the feasibility of providing improvements to reduce flood damages in the vicinity of the Cleveland Zoo. The study is scheduled for completion in 1971.

CANTON **Huntington District**

A detailed project report on channel improvement of Each Branch of Nimishillen Creek at Canton is being prepared. The plan consists of modifying the channel from the Belden Avenue Bridge to the second railroad bridge above Trump Road. The project would be 12,600 feet in length with a channel bottom width of 70 feet.

CROOKSVILLE **Huntington District**

A detailed project report on channel improvement of Moxahala Creek at Crooksville is being prepared. The plan consists of modifying the channel from just downstream of the northern corporation limits upstream to the vicinity of the southern corporation limits. The new channel will be 8,820 feet in length, with bottom widths of 90 and 100 feet.

LEETONIA **Pittsburgh District**

The improvement consisted of deepening, widening, and straightening the channel of Cherry Valley Run through and below the village for a distance of 7,250 feet, and relocation of the lower end of a branch of the Run. The village of Leetonia was the principal cooperating agency, with assistance from Columbiana County and the State of Ohio, Department of Highways. The project was completed in November 1960, at a Federal cost of \$89,300. Flood damages prevented to date are estimated at \$5,000.

LOGAN
Huntington District

A detailed project report is being prepared to determine a means of providing flood protection on the Hocking River for Logan, Ohio. A 140-foot wide channel improvement project in connection with improvements that will be provided by the State of Ohio relative to its highway construction program is the most economically favorable plan for the protection of Logan. The channel would begin at the upper end of the state's 200-foot wide channel improvement at State Route 328 and extend to the lower end of the state's 100-foot wide improvement in the Scott Creek area. No alteration to the stream's bottom is anticipated in connection with the channel widening. Net average annual benefits to the project based on a 50-year project life amount to \$31,000 excluding redevelopment benefits. Estimated cost of the project is \$706,000 of which \$655,000 would be Federal cost.

MIDDLETOWN
Louisville District

A detailed project report for flood control structures on Dicks Creek is being prepared. Study of alternative measures is essentially complete and a partial draft of report has been prepared. Alternate plans by the Miami Conservancy District have been

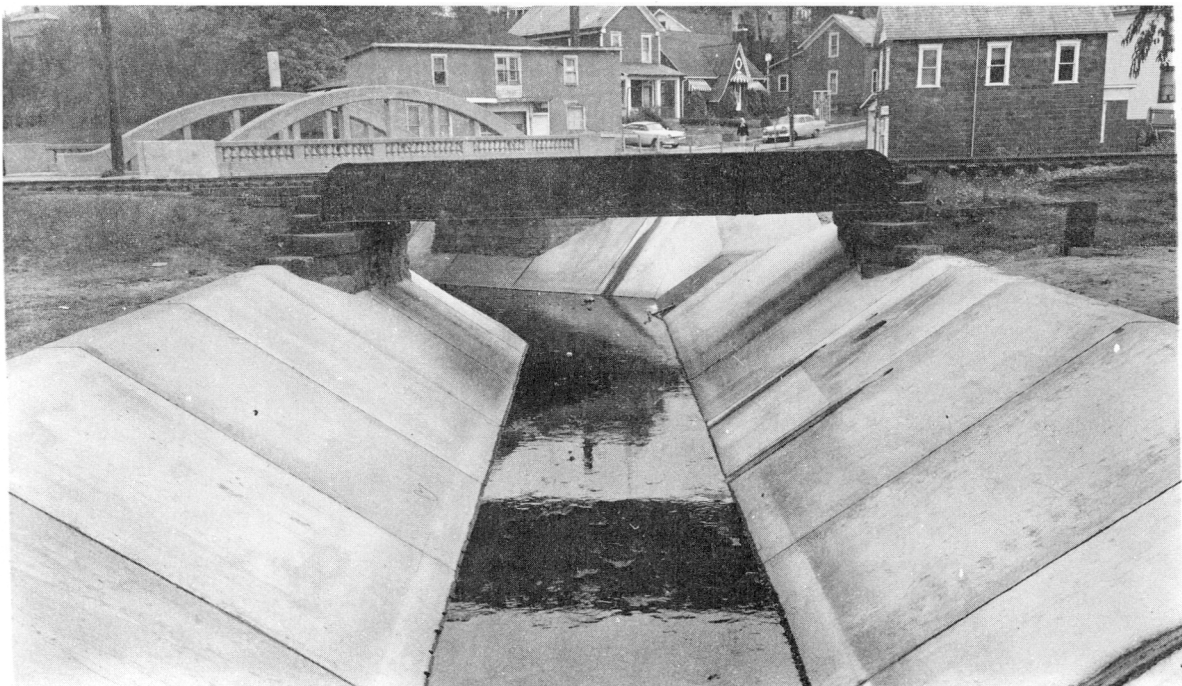
received. Further study is delayed pending completion of presently proposed actions by others. No work accomplished since 1968.

NELSONVILLE
Huntington District

A detailed project report is being prepared to determine a means of providing flood protection on the Hocking River for Nelsonville, Ohio. A 160-foot wide channel improvement from just downstream of State Route 691 to a point 800 feet upstream from Fulton Street would be the most economically favorable plan for the protection of Nelsonville. The project would effect a reduction of about 2-feet just downstream from the Fulton Street Bridge for floods similar in stage to that of March 1964. Recent developments indicate that a spoil levee may be advisable in the vicinity of the athletic field at the foot of Watkins Street. Net average annual benefits for the project based on a 50-year life amount to \$20,600 excluding redevelopment benefits. Estimated cost of the project is \$853,000, of which \$820,000 would be Federal cost.

SIDNEY
Louisville District

A detailed project report for flood control structures on the Great Miami River has been



AMSTERDAM CHANNEL IMPROVEMENT

completed. The work would consist of nearly 5,000 feet of levee along the right bank between the High Street bridge and the New York Central bridge. Two pumping stations and appurtenant drainage structures would be included together with necessary road ramps. Although benefits do not greatly exceed costs, the improvements considered would significantly reduce flooding in school, business and residential areas. Submission of the report is pending approval and assurances by local interests, since construction under Section 205 would involve a much higher non-Federal cost than if the same level of protection were provided as a feature of the Miami River, Little Miami River and Mill Creek General Investigations Study which is considering a dam at Piqua, Ohio, with a flood control pool which would affect Sidney. Such flood pool durations would necessitate a more impervious levee construction than that required for headwater floods only and construction costs would be almost entirely a Federal expense.

OLON
Buffalo District

A reconnaissance report is being prepared to determine the feasibility of providing improvements to reduce flood damages along

Hawthorne Creek. The study is scheduled for completion in 1971.

WASHINGTON COURT HOUSE
Huntington District

The project is located at Washington Court House on Paint Creek. It consists of about two miles of snagging and clearing and one mile of channel widening and realignment. It was completed in 1968 at a Federal cost of \$150,000. Flood benefits credited to the project to date are about \$280,000.

WASHINGTONVILLE
Pittsburgh District

A detailed project report for a channel improvement project on Cherry Valley Run is being prepared. The work would consist of approximately one mile of widening, deepening and realignment of the existing channel. The improvement considered would provide significant benefits through reduction of flood heights in the Washingtonville flood zone. Flood control benefits would be realized through the reduction of flooding in low-lying residential areas of Washingtonville.

SNAGGING AND CLEARING PROJECTS

Section 3 of the River and Harbor Act of 1945 and Section 208 of the Flood Control Act of 1954 provide authority for the Chief of Engineers to snag and clear streams in the interest of navigation and flood control respectively. The three snagging and clearing projects (Section 208) in Ohio are described below.

CANTON
Huntington District

The project, which was completed in March 1965, consists of snagging and clearing 1.0 mile of Nimishillen Creek and 3.2 miles of East Branch thereof within the corporate limits of Canton. The improvement is designed to effect stage reductions of about 2.5 feet in the upper reaches of the project for a flood equal in magnitude to the January 1959 flood. The Federal cost was \$65,000.

PAINT CREEK AT CHILLICOTHE
Huntington District

Located on Paint Creek south of Chillicothe in Ross County. The work will consist of flush cutting of trees and brush and the removal of all

trees, undergrowth, drift, trash, snags and logs from the channel and banks of Paint Creek beginning at the US Route 23 bridge and extending upstream for about 14,250 feet. In addition, bars and silt deposited in the stream bed will be dredged and spoiled and stream banks will be reshaped where required. Average annual damage prevented by the project is estimated at \$24,500. The estimated total cost of the project is \$131,000, of which \$97,000 is Federal cost. Initiation of construction is contingent upon resolution of planning problems.

ROCKBRIDGE
Huntington District

Rockbridge, in Hocking County, is located on the right descending bank of the Hocking River approximately 75 miles above its mouth. The reconnaissance report indicated a channel snagging and clearing project extending 8,000 feet downstream of Rockbridge would be the most economically favorable plan for the protection of Rockbridge. The project would effect reductions of about 0.5 foot on the March 1964 flood, a flood that would occur on the average of once every 35 years. The project would reduce the natural

frequency of a flood of similar magnitude to once every 43 years and would prevent 21 percent of the average annual damages at Rockbridge. The estimated total cost of the project is \$35,200, of

which \$29,600 is Federal cost. Construction for this project has been deferred pending decisions by the Hocking Conservancy District to approve the project as presently planned.

EMERGENCY BANK PROTECTION PROJECTS

Section 14 of the Flood Control Act of 1946 provides authority for the construction of emergency bank protection works to prevent flood damages to highways, bridge approaches, and public works. There are two projects under this authority in Ohio.

INDIAN HILL WATERWORKS Louisville District

The project is a revetment on the right bank of the Little Miami River at Indian Hill, Hamilton County. The supply wells of the village water system had been endangered by caving bank conditions. Upon receipt of assurances of cooperation from officials of the village of Indian Hill, the work was undertaken in January 1964 and

completed in March 1964. The Federal cost was \$37,700.

PLUM STREET BRIDGE Springfield Louisville District

Located on the right bank of Buck Creek, at Springfield, Clark County, Ohio, the project provides for repair of a segment of caving bank endangering the right abutment of Plum Street Bridge and a public road paralleling the stream. After receipt of required assurances of local cooperation in the project from the city of Springfield, the work was undertaken in April 1960 and completed in June 1960. The Federal cost for the project was \$12,500.

EMERGENCY REPAIRS AND OPERATIONS

As provided by Public Law 99, 84th Congress, the Corps of Engineers is authorized to assist local interests in fighting floods and in the repair and restoration of flood control works threatened or destroyed by floods. Descriptions of this type of work accomplished in Ohio follow.

MIAMI RIVER BASIN Louisville District

Emergency repair work for Chapman Creek levee, Eagle City levee, Osborne and Spangler levee, and Snyder and Logan Park levee was completed at a cost of about \$53,000 after the flood of January 1959.

MILL CREEK Louisville District

About \$25,000 was spent for emergency repairs along Mill Creek levee at Reading, damaged by the flood of January 1959.

MUSKINGUM RIVER BASIN Huntington District

Repair and restoration of levees damaged during the January 1959 flood at Mt. Vernon along the Kokosing River and Dry Creek and at Utica along the North Fork of Licking River have been completed at a cost of \$117,000.

PAINT CREEK Huntington District

Levee clearing, repair, and reshaping of levee and banks along Paint Creek at Chillicothe was completed at a cost of \$39,000 due to damage that occurred during the January 1959 flood. Additional work has been accomplished at an estimated Federal cost of \$30,000 to repair damages caused by the March 1963 and March 1964 floods.

RENO BEACH — HOWARD FARMS AREA Detroit District

Restoration of existing dikes damaged by the Lake Erie storm of April 1966 was completed at a cost of about \$42,000 under this authorization.

SCIOTO RIVER BASIN Huntington District

Remedial repairs to that portion of the Portsmouth—New Boston Local Protection Project along the Scioto River which has been endangered by undercutting of the levee was completed in 1965 at an estimated cost of \$161,700.

FLOOD PLAIN INFORMATION STUDIES

As provided by Section 206 of the Flood Control Act of 1960, the Corps of Engineers is authorized to compile and disseminate information on floods and flood damages and to provide engineering advice to local interests for their use in planning and regulating the use of flood plains. Applications for formal reports are initiated by a state or by responsible local governmental agencies.

Priority of accomplishment is determined by coordination with the Ohio Department of Natural Resources. Formal reports typically include maps, profiles, charts, tables, photographs, and narrative describing the extent, depth, and duration of inundation by historical floods and those that may reasonably be expected to occur in the future. Approved studies in Ohio are listed below.

Locality	District	Status
Alum Creek (Columbus and Vicinity)	Huntington	Completed in 1967.
Auglaize River (Wapakoneta)	Detroit	Completed in 1968.
Big Walnut Creek (Columbus and Vicinity)	Huntington	Completed in 1968.
Black River (Lake Erie to Carlisle Township)	Buffalo	Completed in 1964.
Black River (July 1969 Flood) (Lake Erie to Carlisle Township on East and West Branches)	Buffalo	Completed in 1970.
Chagrin River (Lake Erie to Chagrin Falls)	Buffalo	Completed in 1968.
Cuyahoga River Basin:	Buffalo	
Cuyahoga River from above Cleveland Harbor to below Sagamore Hills, including lower Big Creek and lower Tinkers Creek		Completed in 1968.
Cuyahoga River through Sagamore Hills, Boston, and Northampton		Completed in 1969.
Tinkers Creek through Twinsburg		Completed in 1970.
Cuyahoga River from the mouth of Fish Creek to Lake Rockwell, including lower Fish Creek and lower Congress Lake Outlet		To be completed in 1971.
Cuyahoga River through Mantua and Hiram		To be completed in 1972.

Locality	District	Status
Cuyahoga River from above Northhampton to the mouth of Fish Creek		To be completed in 1972.
Hocking River (Athens)	Huntington	To be completed in 1971.
Huron River (July 1969 Flood) (Lake Erie to Standardsburg on West Branch and Peru Township on East and West Branches)	Buffalo	Completed in 1970.
Mahoning River (Leavittsburg and Warren) Trumbull County	Pittsburgh	To be completed in 1971.
Mahoning River (Niles, McDonald and Girard) Trumbull County	Pittsburgh	To be completed in 1971.
Mahoning River and Crab Creek (Youngstown, Campbell, Struthers and Lowellsville) Mahoning County	Pittsburgh	To be completed in 1971.
Little Miami River (Lower 40 miles)	Louisville	Study is complete and distribution made in 1968.
Maumee River (Defiance)	Detroit	Scheduled for completion in 1970.
Maumee River (Napoleon)	Detroit	Scheduled for completion in 1970.
Mosquito Creek (Reservoir to mouth)	Pittsburgh	Completed in 1966.
Nimishillen Creek and Tribs. (Canton)	Huntington	Completed in 1966.
Ohio River (Adams County)	Huntington	To be completed in 1971.
Ohio River (Belmont County)	Pittsburgh	To be completed in 1971.
Ohio River (Brown County)	Huntington	To be completed in 1971.
Ohio River (Columbiana County)	Pittsburgh	To be completed in 1971.
Ohio River (Hamilton and Clermont Counties)	Louisville	Completed in 1968.

Locality	District	Status
Ohio River (Jefferson County)	Pittsburgh	To be completed in 1971.
Ohio River (Lawrence County)	Huntington	To be completed in 1971.
Ohio River (Monroe County)	Pittsburgh	To be completed in 1971.
Ohio River (Scioto County)	Huntington	To be completed in 1971.
Ottawa River (Lima)	Detroit	Completed in 1967.
Ottawa River (Toledo)	Detroit	Study will be initiated upon allotment of funds.
Rocky River Basin:	Buffalo	
Main stem of Rocky River from Lake Erie to first Metropolitan Park Bridge (1.3 miles)		Completed in 1968.
West Branch from main stem to Medina County line		To be completed in 1970.
West Branch from Medina County line to North Branch; North Branch to Plum Creek (Brunswick); and Plum Creek to below Brunswick Hills		To be completed in 1972. Study will be initiated upon allotment of funds.
Remainder of Plum Creek (Brunswick)		Study will be initiated upon allotment of funds.
Plum Creek (Columbia) from West Branch to Medina County line		Study will be initiated upon allotment of funds.
East Branch from Bennett Road to Hincklay Lake Dam		Study will be initiated upon allotment of funds.
Sandusky River (Sandusky Bay to Tiffin)	Buffalo	Completed in 1964.
Scioto and Olentangy Rivers (Vicinity of Columbus and Chillicothe)	Huntington	Completed in 1966.
Stillwater and Little Stillwater Creeks (Uhrichsville - Dennison)	Huntington	To be completed in 1971.
Swan Creek (Toledo)	Detroit	Study will be initiated upon allotment of funds.
Tuscarawas River (Newcomerstown)	Huntington	To be completed in 1971.

Locality	District	Status
Tuscarawas River (New Philadelphia—Dover)	Huntington	To be completed in 1971.
Tuscarawas River (Stark County)	Huntington	Completed in 1970.
Vermilion River (Lake Erie to Mill Hollow)	Buffalo	Completed in 1965.
Vermilion River (July 1969 Flood)	Buffalo	Completed in 1970.

REGIONAL INVESTIGATIONS

DEVELOPMENT OF WATER RESOURCES IN APPALACHIA Ohio River Division

OHIO RIVER DIVISION

Section 206 of the Appalachian Regional Development Act of 1965 directed the Secretary of the Army to prepare a comprehensive plan for the development and efficient utilization of the water and related resources of the Appalachian Region giving special attention to the need for an increase in the production of economic goods and services as a means of expanding economic opportunities and enhancing the welfare of the people.

The Appalachian Region covers an area of 195,000 square miles in thirteen states, extending from southern New York to northeastern Mississippi. A portion of southeastern Ohio is in the Appalachian Region. The region includes the Ohio counties of: Adam, Athens, Belmont, Brown, Carroll, Clermont, Coshocton, Gallia, Guernsey, Harrison, Highland, Hocking, Holmes, Jackson, Jefferson, Lawrence, Meigs, Monroe, Morgan, Muskingum, Noble, Perry, Pike, Ross, Scioto, Tuscarawas, Vinton, and Washington.

Twenty-five volumes of published studies on the Development of Water Resources in Appalachia have been prepared by the U.S. Army Corps of Engineers. A general water and related resources plan was developed through the cooperative efforts of Federal, State and local agencies and organizations with the assistance of the Appalachian Regional Commission. The studies contain an early action plan, a plan for future studies, programs for Federal agencies and programs for Appalachian States. Copies of these published studies may be purchased from the Division Engineer, Ohio River Division.

The Secretary of the Army issued a public announcement on his proposed report and the published Corps studies which are now being reviewed by Federal and State agencies.

OHIO RIVER BASIN COMPREHENSIVE SURVEY

Ohio River Division

The comprehensive survey of the Ohio River Basin, exclusive of the Tennessee River Basin has

been completed and is now available for public distribution. The results are published in 14 volumes, consisting of a Main Report and 13 Appendices. The study area is 163,000 square miles in extent and includes portions of 11 states having a population of about 10 percent of the Nation's total. Included in the study area are major portions of Ohio, Indiana, Kentucky and West Virginia, substantial parts of Pennsylvania, Illinois and Tennessee, and relatively small areas of New York, Maryland, Virginia, and North Carolina. The basic study authorization is a resolution adopted 16 May 1955 by the Committee on Public Works of the United States Senate. The study effort was coordinated by the Ohio River Basin Coordinating Committee which included representatives of the Departments of Agriculture; Army; Commerce; Health, Education and Welfare; Interior; the Federal Power Commission and the eleven states in the study area.

The study provides appraisals and geographic distribution of the water and related land resources of the Ohio River Basin and the location, nature and magnitude of the basin's water-related problems and needs to the year 2020. The study also includes a framework plan to serve as a general guide for resource conservation and development in the Ohio River Basin to the year 2020, with intermediate objectives to the years 1980 and 2000.

Presently, the completed study is under review by the Water Resources Council. After considering the comments of the Governors of the affected States and other interested Federal agencies, the Council will then prepare its final report on the study for transmittal to the President of the United States for his review and ultimate transmittal to Congress.

An information booklet has been prepared which presents the general findings of study and includes a report volume index and corresponding price list. Copies of this booklet may be obtained from:

U.S. Corps of Engineers
Ohio River Division
ATTN: ORDAS
P.O. Box 1159
Cincinnati, Ohio 45201

SURVEYS UNDER WAY

Studies made by the Corps of Engineers in Ohio are one of the means of keeping the overall program abreast of changing needs and situations. This phase of the work is undertaken in response to specific Congressional authorizations calling upon the Corps of Engineers to investigate problems related to the water resources development program. There are 39 investigations of this nature pertaining to localities in the state of Ohio that are in varied stages of completion at this time and they include consideration of flood control, drainage, navigation, water supply, power, water quality control, recreation, and related water and land uses.

The survey program affords opportunity for coordination of the planning activities of the Corps of Engineers with those of local interests and other agencies of government concerned with the water resources problems at hand.

Proposals are given consideration in detail sufficient to determine their technical and economic soundness and the degree of Federal interest involved. The findings are reported to Congress where they are used as a guide in the adoption or modification of water resources development projects. Ohio surveys are:

Name of Investigation	Purpose	Status
Ashtabula—Lake County Line to Ashtabula (Buffalo District)	To determine the advisability of providing improvements, under Section 103 of the 1962 River and Harbor Act, for control of shore erosion along 2,000 feet of public highway frontage.	A reconnaissance report was completed by the District Engineer in 1968.
Auglaize River at Wapakoneta (Detroit District)	To determine the advisability of providing improvements for small craft navigation on the Auglaize River within the village of Wapakoneta.	Brief unfavorable report proposed.
Beaver River and Tributaries, Ohio and Pennsylvania, (Pittsburgh District)	A comprehensive investigation of basin-wide development of the Beaver, Mahoning and Shenango River Basins for flood control, navigation, low water regulation, water supply, hydroelectric power and recreation.	Indefinite.
Bellevue and the surrounding area (Buffalo District)	To determine the advisability of providing improvements to control floods caused by excess underground and surface waters.	Indefinite. Not yet funded.
Central Ohio (Huntington District)	The study will encompass the investigation and presentation, in survey-scope detail, of all structural and non-structural measures which will be recommended for construction or enactment, respectively, for the orderly development of the region's water resources and satisfaction of current and long term needs. In addition a re-evaluation will be made and an interim report submitted on the potential Logan Lake which would be located on Clear Creek, a tributary of the Hocking River.	Studies will be initiated in late FY 1971. Scheduled for completion in FY 1975. Interim report on potential Logan Lake scheduled for initiation in FY 1972 and completion in FY 1973.

Name of Investigation	Purpose	Status
Clear Fork of Mohican River and Rocky Fork of Black Fork of Mohican River (Huntington District)	To determine the advisability of improving Clear Fork and Rocky Fork for flood control and allied purposes.	Investigation will be included in Muskingum River Basin Study.
Cleveland Harbor, Drift Removal (Buffalo District)	To determine the advisability of adopting a separate project for removal of drift and accumulated debris in Cleveland Harbor and tributary waters.	Favorable report under consideration by Chief of Engineers.
Conotton Creek and tributaries (Huntington District)	To determine the advisability of improvements of Conotton Creek and its tributaries for flood control.	Investigation will be included in Muskingum River Basin Study.
Cross Wabash Valley Waterway (Louisville District)	To determine the feasibility and advisability of providing navigation improvements on the Wabash River and adjacent streams from the Ohio River to Lake Michigan and Lake Erie.	Scheduled for completion in 1972.
Cuyahoga River (Buffalo District)	To determine the advisability of providing improvements for flood control and reduction of sedimentation in Cleveland Harbor.	Study under way. Completion indefinite, pending agreement on provision of local cooperation.
Cuyahoga River, from Kent to Cuyahoga Falls (Buffalo District)	To determine the advisability of providing improvements for flood control, pollution abatement, low flow regulation, and other allied purposes.	Study under way. Completion dependent upon future allocation of funds.
Grand River Lake (Pittsburgh District)	To reanalyze the design and operation of the reservoir portion of the Lake Erie—Ohio River Canal (by direction of the House Committee on Appropriations) for the purposes of flood control, municipal and industrial water supply, water quality control, recreation, and fish and wildlife. Particular attention would be given towards integrating any proposed project into the existing system of projects in the Beaver River Basin.	District studies have been suspended pending completion of the State of Ohio Northeast Ohio Water Plan.
Great Lakes De—Icing Study (Detroit District)	To investigate and study means of extending the navigation season on the Great Lakes and St. Lawrence Seaway.	Feasibility study has been completed and is now under consideration by the Chief of Engineers.
Great Lakes Harbor Study (North Central Division)	To determine the advisability of further improvements of the harbors on the Great Lakes in the interest of deep—draft commerce.	Final summary report submitted to Congress on 27 October 1967 and printed as House Document 178, 90th Congress, 1st Session.

Name of Investigation	Purpose	Status
Great Lakes Region (North Central Division)	To develop a comprehensive coordinated plan for water and related land resources development in the Great Lakes Basin.	Study under way. Completion dependent upon future allocation of funds.
Great Miami, Little Miami, and Mill Creek (Southwest Ohio) Study (Louisville District)	To develop a plan in cooperation with state and local governments and private interests for the optimum development of the water and related land resources of the study area.	Interim report on flood control and recreation in the Mill Creek Basin completed and submitted to Congress in 1970. Definition and quantification of public needs and available resources underway in 1970. Final report embodying comprehensive, coordinated plans scheduled for 1974.
Hocking River and tributaries (Huntington District)	To determine the advisability of improvements for flood control and allied purposes in the Hocking River Basin with particular reference to the upper basin and the vicinity of Athens.	Study complete and is being included in Report on Water Resources Development in Appalachia.
Killbuck Creek (Huntington District)	To determine the advisability of providing improvements for flood control in the Killbuck Creek Basin.	Investigation will be included in Muskingum River Basin Study.
Lake Erie—Lake Ontario Waterway (Buffalo District)	The present deep-draft connection between Lake Erie and Lake Ontario is the Welland Canal in Canada. Increasing traffic will reach the practical capacity of that canal in the foreseeable future. This study will consider the engineering and economic feasibility of constructing a canal in the United States to provide the facilities necessary for the anticipated further increases in waterborne traffic.	Study under way. Completion dependent upon future allocation of funds.
Leatherwood Creek at and in vicinity of Cambridge (Huntington District)	To determine the advisability of improvement of Leatherwood Creek in the interest of flood control and water supply for the city of Cambridge.	Investigation will be included in Muskingum River Basin Study.
Little Beaver Creek and tributaries, Ohio and Pennsylvania (Pittsburgh District)	Review to determine the advisability of improvements for flood control and allied purposes on Little Beaver Creek and tributaries.	Completion date is indefinite, contingent upon availability of funds.
Lorain Harbor (Buffalo District)	To determine the advisability of providing additional harbor improvements to accommodate small boats.	Study to be completed under Section 107 of the 1960 River and Harbor Act.

Name of Investigation	Purpose	Status
Maumee River and tributaries, Ohio and Indiana (Detroit District)	To determine the most economical means of controlling floods on the Maumee River and its tributaries. Particular problem areas have been identified at Defiance, Findlay, Florida, Grand Rapids, Napoleon, Oakwood, Ottawa, Perrysburg, St. Marys, part of Toledo, Wapakoneta, and Van Wert, Ohio; and Auburn and Fort Wayne, Indiana. Drainage problems along the Auglaize, Blanchard, St. Marys, and Tiffin Rivers, Ohio, were also under consideration.	Interim reports have been submitted for the Tiffin River covering major drainage problems, and for Findlay and Ottawa, Ohio, covering flood problems. Improvements at Ottawa were authorized by the Flood Control Act of 1966. Completion date of a draft of the final report is scheduled for FY 71.
Moxahala and Jonathan Creeks (Huntington District)	To determine the advisability of improvement of Moxahala Creek and Jonathan Creek for flood control.	Investigations will be included in the Muskingum River Basin Study.
Muskingum River Basin Study (Huntington District)	To determine if present comprehensive plan insures orderly and sound development and coordination of water resources of the basin. All phases of water resource development will be considered and existing reservoir projects will be examined to determine if additional improvements or reallocations of storage are needed to gain maximum utilization.	Study initiated in 1964. Completion scheduled for 1971, contingent upon availability of funds.
Muskingum River Navigation (Huntington District)	To determine the advisability of modernization of obsolete Muskingum River navigation system.	Investigation will be included in Muskingum River Basin Study.
Ohio River and specified reaches of Allegheny, Monongahela, and Kanawha Rivers (Ohio River Division)	To determine the desirability of modifying the existing 9-foot navigation project and the probable cost of a 12-foot navigation project.	Indefinite. Partially complete.
Olentangy River (Huntington District)	To determine the advisability of channel improvement of the Olentangy River downstream from Delaware Dam to Columbus.	Studies have not been initiated. Completion date is indefinite, contingent upon availability of funds.
Point Place, Toledo (Detroit District)	To determine the advisability of providing flood protection, with particular reference to the advisability of protection work against storm waves and wind generated high lake levels.	Report has been completed and is now under review.

Name of Investigation	Purpose	Status
Portsmouth—New Boston (Huntington District)	To determine if modification of the authorized project is advisable at this time. Particular attention will be given to interior drainage, pumping capacities, ponding areas and sewage treatment problems in connection with the ponding areas.	Study was initiated in 1968 and is scheduled for completion in Fiscal Year 1971.
St. Lawrence Seaway, Additional Locks (Buffalo District)	To determine the advisability of construction of additional or duplicate locks in the United States.	Study under way. Completion dependent upon future allocation of funds.
Sandusky River (Buffalo District)	To consider the advisability of providing improvements for flood control, including local improvements at Fremont, Tiffin, and Bucyrus and a multiple-purpose reservoir above Bucyrus.	Partially favorable interim report recommending local improvements at Fremont was submitted to Congress in 1962 and led to authorization of the existing project for that community. Completion of the final report is scheduled for 1971.
Sandy Creek (Huntington District)	To determine the advisability of providing flood protection throughout the Sandy Creek Basin by the most economical method.	Investigation will be included in Muskingum River Basin study.
South Shore of Lake Erie—Ohio, New York, Pennsylvania, and Michigan (Buffalo & Detroit Districts)	To determine the advisability of providing additional harbors or improvements for small boats along the southern shore of Lake Erie.	Favorable interim report on Rocky River Harbor, submitted to Congress in 1964, and on Conneaut Harbor, submitted to Congress in 1966, led to authorization of additional improvements of these harbors. Initial studies for similar reports on Cooley Creek, Fairport Harbor and Geneva—on—Lake are in progress. Interim report to investigate the advisability of recreational navigation harbor on the Ottawa River has been completed and is now under review. Interim reports for improvements at Turtle Creek, Port Clinton Harbor and Put-in-Bay Harbor is dependent upon future allocation of funds.
Toledo Harbor (Detroit District)	To consider the need for an anchorage basin for deep-draft vessels at Toledo Harbor.	Under consideration under Section 107 of the 1960 River and Harbor Act.

Name of Investigation	Purpose	Status
Wabash River Basin Comprehensive Study, Illinois, Indiana, and Ohio (Louisville District)	Development of a comprehensive basin-wide plan for development of water and related land uses and resources in cooperation with other Federal, state, and interstate agencies. Both immediate and long-range needs will be investigated.	The final report is complete and is scheduled for review by the Water Resources Council in 1971.
Water Levels of the Great Lakes (North Central Division)	To investigate factors that affect fluctuations of the Great Lakes as well as to determine the feasibility of a plan of regulation of lake levels that will best serve the interests of all water uses. These uses include: reduction of damages to shore properties, navigation, power development, local flood control protection for shore areas and tributary streams that are subject to flooding as a result of fluctuations in the lake levels.	Favorable interim report on local protection on west end of Lake Erie submitted to Congress on 26 May 1954 recommending federal local protection projects be constructed at three localities on Lake Erie. Report was published as House Document 424, 83rd Congress, 2nd Session. Not yet acted on by Congress. The second phase of the report involving the feasibility of developing a plan of regulation of levels of the Great Lakes is completed. This report has not been presented as a document but is available for purchase from the North Central Division. The report contains no conclusions concerning the justification of measures for further regulation of levels of the Great Lakes.
Whiteoak Creek, Brown County (Huntington District)	To determine the advisability of constructing a multiple-purpose reservoir on Whiteoak Creek for flood control, water supply, low-flow regulation, economic expansion, and allied purposes.	The study results were made available to the International Joint Commission of Canada and the United States, which is undertaking an international study to determine whether measures within the Great Lakes Basin can be taken in the public interest to regulate further the levels of the lakes. Study complete and included in Report for Development of Water Resources in Appalachia.
Whitewater River and tributaries, Indiana and Ohio (Louisville District)	Development of a general plan or modification of approved plans for flood control and allied purposes in the Whitewater River Basin.	Completion unscheduled.

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